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Surplus Property Presents Problems

SOME idea of the problems that possibly may develop in connection with disposal of surplus foundry equipment may be gained through a study of a recent report of the Steel Division, War Production Board, on "Steel Expansion for War". Statistics from the report show that from Jan. 1, 1940 through June 30, 1944, government agencies financed expansions in steel, gray iron and malleable foundries to the extent of $156,880,852 (p. 128). This total does not include government financed projects in brass and bronze, and in aluminum and magnesium foundries, where considerable expansion also took place.

Assuming that outside of navy yards and arsenals the government will not remain in the foundry business following victory over Japan, this public investment in foundries must be liquidated. While numerous plants and plant additions probably will be sold as complete units for operation in the postwar period, some special purpose expansions may not be suitable for civilian production, and therefore will be dismantled and the equipment sold piecemeal. Where entire plants are disposed of as surplus, many problems will be encountered in arriving at a selling price which will be fair to the buyer of the plant and still will protect the investment of the taxpayer as far as possible. Every effort must be made to prevent disposal at a price which will permit the purchaser to have an undue advantage in production costs that may upset the price structure of the industry.

Equipment sold piecemeal presents an entirely different disposal problem. In the main such equipment may be divided into the following three main classifications: 1—Standard equipment which may be used readily in civilian production; 2—Semi-special equipment which can be converted completely or in part to civilian production; 3—Special equipment designed specifically for one particular war job and not suitable for conversion to peacetime operations.

Since the actual sales of surplus property are being handled by the district offices of government agencies, and the personnel of those offices cannot be familiar with all of the many types of machines and other products which are being offered for sale, purchasers of foundry equipment themselves must be familiar with the possibilities and limitations of any machines which may be acquired. Practically all of the special equipment and probably a large amount of the semispecial equipment possibly cannot be adapted economically to the production of civilian goods.

Manufacturers of foundry equipment have intimate knowledge of the machines which they have produced during the war emergency, and are ready and anxious to advise foundrymen on the adaptability of such equipment to the production of castings in the postwar period.

Before making any purchases of surplus government property, consult with these equipment manufacturers and thus save yourself money and avoid the possibility of future headaches.

Frank G. Steinebach
Editor

EFFECTIVE Shrink-Bob

By HENRY C. WINTE
Metallurgist
Worthington Pump & Machinery Corp., Buffalo
and
TOM BARLOW
Metallurgist
Battelle Memorial Institute, Columbus, O.

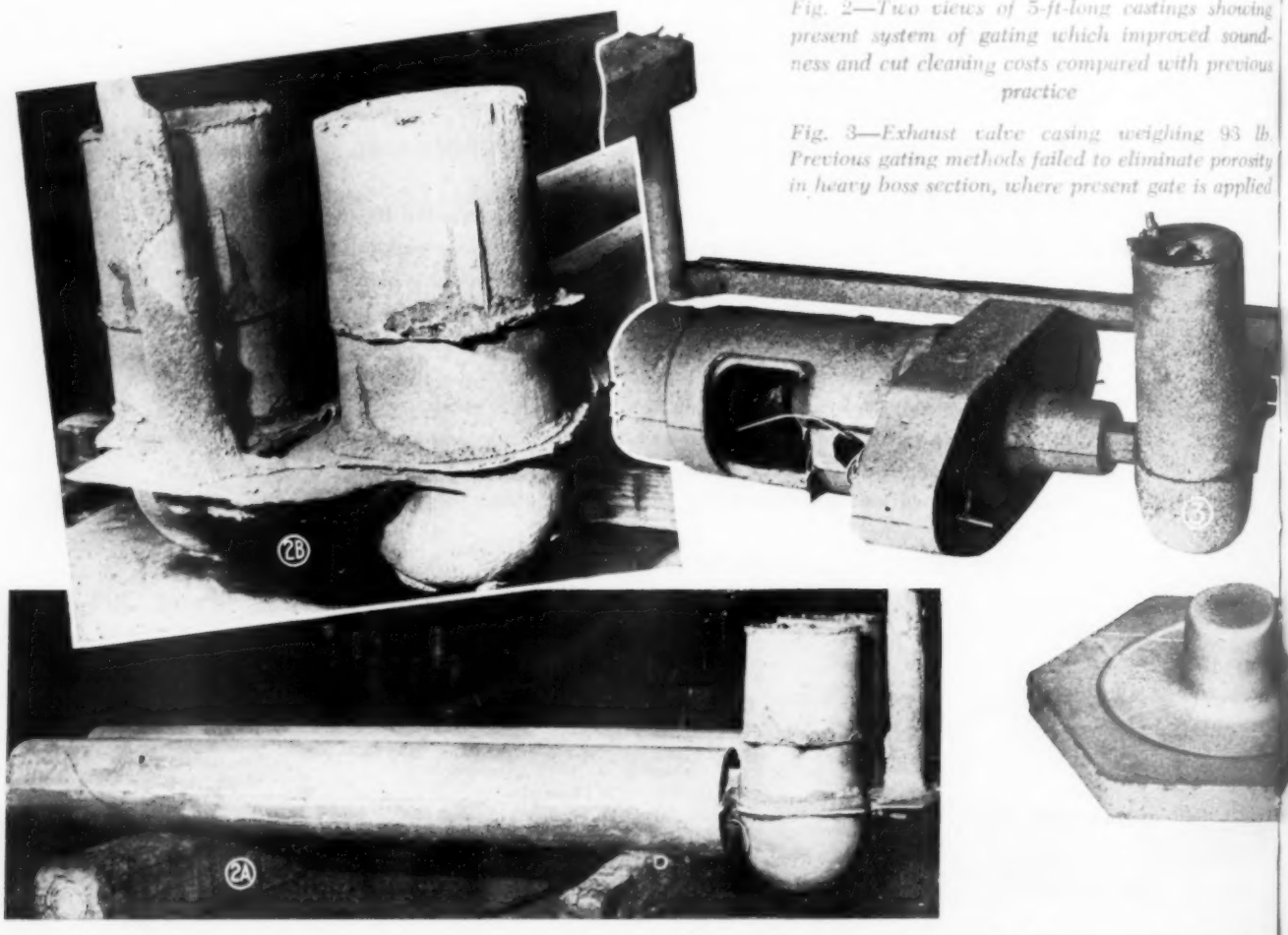
ONE of the interesting and practical developments resulting from the co-operative approach to fundamental problems, featured by the Gray Iron Research Institute, is the present design of the shrink-bob riser. Development of the shrink-bob method of feeding gray iron castings resulted from discussions of the problem of shrinkage, in an attempt to ensure adequate feeding and maximum soundness in intricate castings. In attempting to eliminate, as far as possible, misunderstandings concerning explanations for shrinkage defects, it was observed that arguments regarding shrinkage defects frequently were stalemated by the fact that the gating system used on the casting did not permit adequate feeding and, therefore, did not indicate properly the shrinkage characteristics of the metal.

It should not be necessary to remind foundrymen that the removal of a riser or feeder from a gray iron casting frequently discloses a shrink cavity at the junction of the riser and the casting. This defect is all too common, in spite of the fact that it should be obvious that a shrink at the very base of a riser indicates something fundamentally incorrect in the casting riser design. It is also common, and perhaps more unfortunate, to discover porous or shrink conditions at the juncture of two or more sections of unequal size and cooling rate, when the casting is being machined. These difficulties are, of course, usually attributed to shrinkage, and the defect may be blamed upon the gating system in many cases. More frequently, however, the defect is attributed to the composition or the characteristic of the metal used.

It is the contention of the authors that a large percent-

Fig. 2—Two views of 5-ft-long castings showing present system of gating which improved soundness and cut cleaning costs compared with previous practice

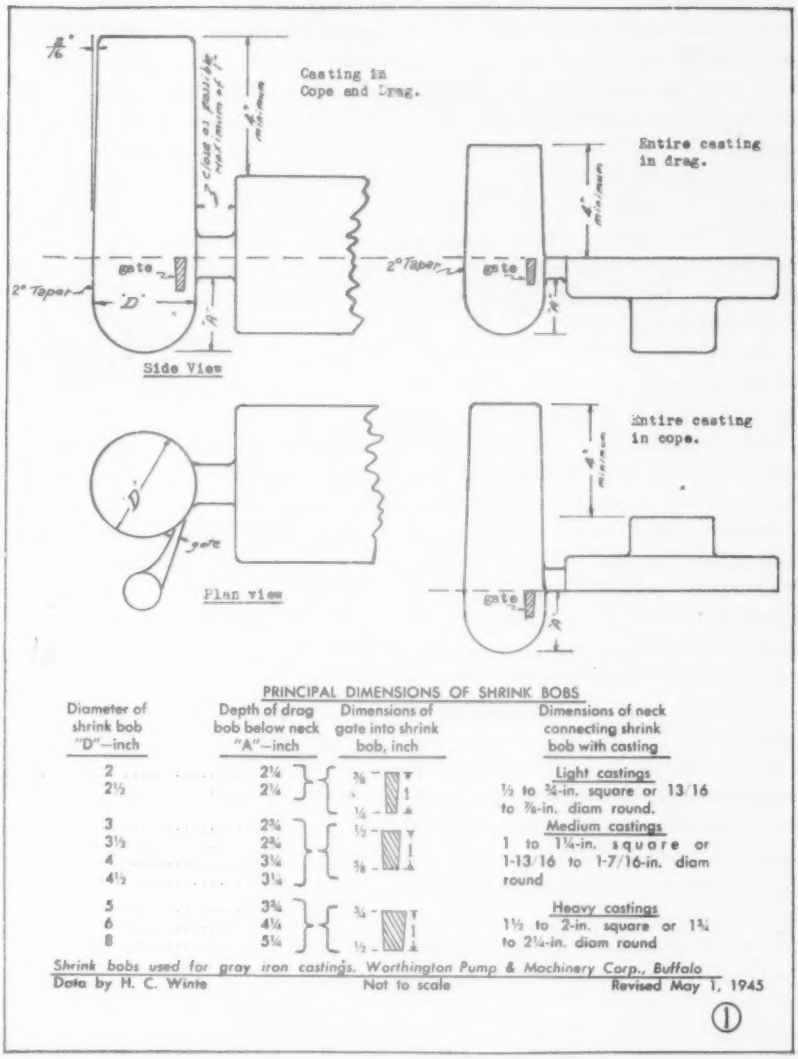
Fig. 3—Exhaust valve casing weighing 93 lb. Previous gating methods failed to eliminate porosity in heavy boss section, where present gate is applied



Risers

age of these porosity defects are directly attributable to poor gating and feeding design. Furthermore, the chances of this defect being caused by the gating or feeding system are so great that no foundryman should attribute such a defect to metal characteristics until he has utilized a correct gating and feeding system and has given the metal every opportunity to feed the casting correctly and avoid so-called porosity or shrinkage defects.

The authors have been connected with the foundry business far too long to state or even imply that one gating system is equally applicable to all types and sizes of castings. However, they are convinced that it is theoretically and practically possible to design a system of gat-



PRINCIPAL DIMENSIONS OF SHRINK BOBS

Diameter of shrink bob "D"—inch	Depth of drag bob below neck "A"—inch	Dimensions of gate into shrink bob, inch	Dimensions of neck connecting shrink bob with casting
2	2¼	⅜ × ⅜	Light castings
2½	2¼	½ × ½	½ to ¾-in. square or 13/16 to ⅞-in. diam round.
3	2¾	½ × ½	Medium castings
3½	2¾	½ × ½	1 to 1¼-in. square or 1-13/16 to 1-7/16-in. diam round
4	3¼	⅝ × ⅝	
4½	3¼	⅝ × ⅝	
5	3¾	¾ × ¾	Heavy castings
6	4¼	¾ × ¾	1½ to 2-in. square or 1¾ to 2¼-in. diam round
8	5¼	½ × ½	

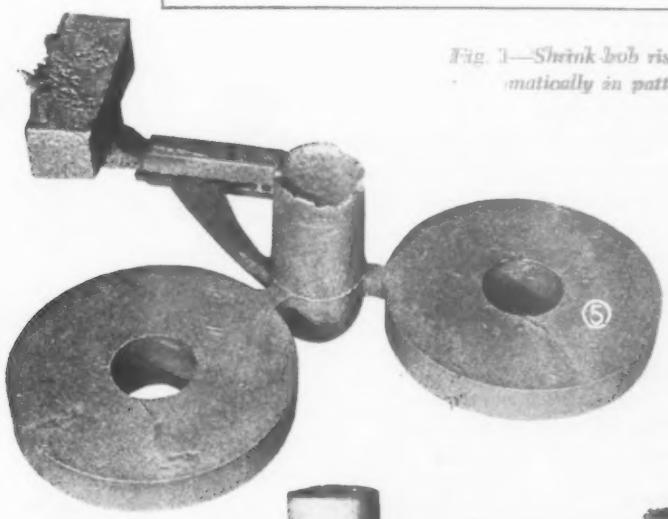
Shrink bobs used for gray iron castings. Worthington Pump & Machinery Corp., Buffalo
Data by H. C. Winte — Not to scale — Revised May 1, 1945

①

Fig. 1—Shrink-bob riser design as shown diagrammatically in patternmakers layout sheet

Fig. 5—Illustrating method of pouring two castings from one shrink-bob riser. These castings weigh 50 lb each and require maximum density

Fig. 4—Showing gating system used for cylinder head weighing 88 lb. Previous gating systems permitted shrink cavities which were discovered only after machining



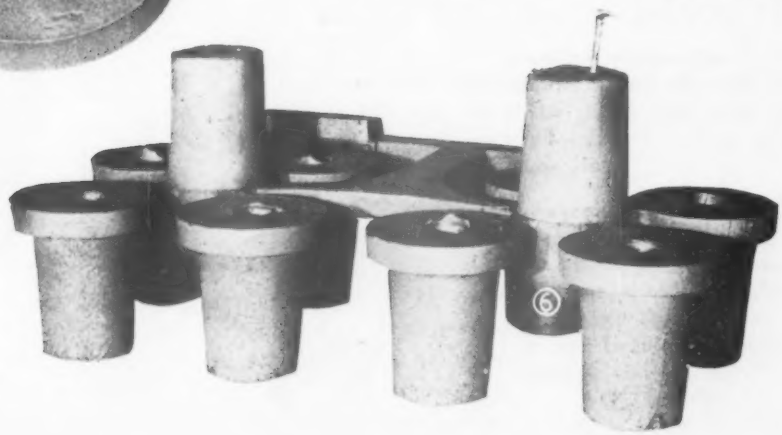


Fig. 6—Method of pouring eight 20-lb sheave bushings with one down sprue and two shrink-bob risers

ing and feeding which will cover a wide range of sizes, shapes, and metal characteristics if the principles of directional solidification are properly taken into account. Indeed, such a standard system of gating was adopted by the Buffalo Division of the Worthington Pump & Machinery Corp.,[3] and later by other members of the Gray Iron Research Institute, and has proved successful in a large majority of the applications attempted up to the present time. In fact, this method of feeding has proved so successful that the authors are exposing themselves to an avalanche of criticism by attempting to tell other foundrymen how to gate their castings.

The shrink-bob riser, as utilized at the present time, is merely an outgrowth of a system which has been used in the malleable iron industry for a great many years. The initial malleable iron design, however, has been modified and adapted to gray iron practice by taking into consideration the work of Brisbois and Cartwright[1], Scott[2], Morken, Carmody[2], and others. Many variations of the design have been tried and discarded until the present form was arrived at and adapted to a large number of commercial applications. It is to be anticipated that a few changes will be made from time to time as we learn more about theory and practice of metal solidification through the co-operative research program sponsored by the Gray Iron Research Institute.

Shrinkage or porosity difficulties which bear a direct relationship to the riser or feeder are most commonly attributable to improper location, improper size, or improper shape of the feeding head, such that either the riser, or the connection between the riser and the casting, froze before the casting had been adequately fed with molten metal. It is common knowledge in the gray iron foundry business that a riser cannot feed a heavy section of a casting unless it is connected to that heavy section in such a way that the connection remains liquid. Consequently, very few foundrymen attempt to feed a casting by placing the riser at the light section which is apt to freeze off and prevent feeding of heavier sections farther removed from the riser. On this basis, the authors will make the assumption in all subsequent descriptions that the foundryman realizes that the riser must be placed at, or sufficiently near, the heavy section of the casting which is being fed.

The major difficulty with most riser designs is that the riser probably contains cold metal which is not capable of feeding back into the section of the casting which is shrinking. The obvious cure for such a condition is to make sure that the metal in the riser is the hottest metal in the casting, rather than the coldest. One method for accomplishing this purpose is to "touch-back" the riser with molten iron, and the other is to feed or gate the casting through the riser. The "touch-back" system usually is effective, but primarily a nuisance, so that it would seem more desirable to design the gating system to permit the last metal going into the mold to be retained by and in the riser to be used for feeding purposes. In other words, the casting should be gated through the riser.

The shrink-bob riser design incorporates this feature of feeding hot metal into the riser section and is, therefore, new only in that it more completely and definitely describes the proper proportion and proper utilization of the principle of gating through the riser. By properly defining the correct proportions of such a system, the shrink-bob riser design permits of more widespread utilization of an old principle.[3]

The shrink-bob riser design is described diagrammatically in the patternmaker's layout sheet shown in Fig. 1. The proportions specified in this drawing have proved to be successful and necessary over a period of years. In fact, any departure from the proportions shown may readily prevent directional solidification and eliminate all of the advantages of this method of gating gray iron castings. Therefore, it is to be hoped that no foundryman will find it necessary to alter or modify the proportions, and then come to the conclusion that the system itself is

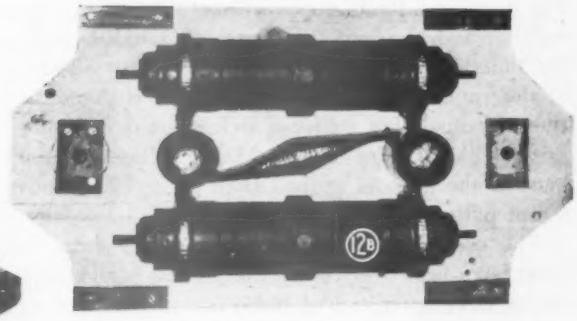
Fig. 7—Casting on ***left, weighing 71 lb, previously was made with large riser on top of heavy section and required*** *15 minutes for cleaning.* ***Casting on right weighs*** *41 lb* ***and must be sound at junction of riser and casting***

Fig. 8—Two castings ***previously scrapped because*** *of leakage difficulty.* ***Bottom casting weighs*** *29 lb* ***and must*** *be leak-proof after* ***boring*** *out* ***center hole.*** *One at top, weighing 40 lb,* ***is troublesome at junction of flange and heavy section***

*Fig. 9—****Two different applications of shrink-bob riser to*** *eliminate porosity in* ***bored hole*** *at* ***center of heavy sections.*** *Valve* ***cover at left weighs*** *42 lb, previously* ***required use of*** *chills. Group* ***at right consists*** *of 4-lb bushings*

Fig. 11—Small "stick" castings weighing 150 lb each. Casting on right, gated with 3-in. shrink bob, using neck 1½ in. square, 1 in. long, and pull down of metal on cope side 14 in. from neck of riser. Casting on left, made with 6-in. diameter shrink-bob riser, neck 1½ in. square, 1 in. long, was sound and dense

Fig. 12—Pattern for cylinder castings, four on a plate, with two shrink-bob risers fed by one sprue



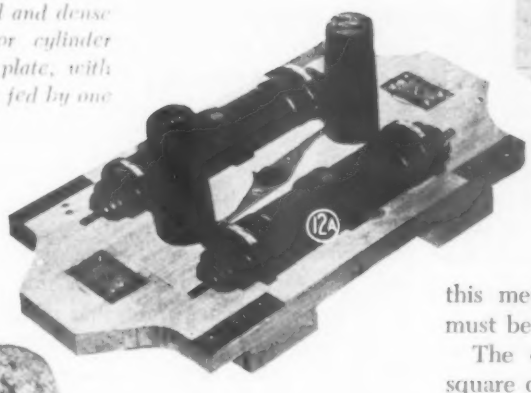


Fig. 10—Two methods of pouring groups of small or medium size castings. Group at left contains four 8-lb bushings poured with one sprue and two risers. Ones on right include two 20-lb castings using one riser

faulty. *It appears that a gating or risering system which is almost correct may be completely wrong.* The proportions of the feeding and gating system are either right or they are not right; the dividing line is very sharp and distinct and is amply demonstrated by the scrap pile.

In order to describe properly the function of the various portions and proportions of this feeding system, it is necessary to start with that portion of the feeder which connects the shrink-bob riser to the casting. This section is known as the neck of the riser. The exact dimensions of the riser neck are determined by the weight of the casting. However, *the length of the neck should never be greater than 1 in., in order to avoid preliminary freezing and prevention of proper feeding!* If the neck is kept short, the sand immediately surrounding it becomes sufficiently hot during the pouring and feeding period to permit proper flow of metal until the final solidification of the casting. This is true in spite of the unusually small diameter or cross section of the neck recommended in this design. The short, small neck used in the shrink-bob riser design is one of the more important features and valuable attributes of this method of gating. The proportions recommended must be carefully observed.

The cross-sectional area of the neck may be either square or round, but should be as small as possible to facilitate easy removal in the cleaning room. At the same time, the neck must be sufficiently large to remain liquid until after the casting has solidified and the feeding has ceased. The following dimensions have been found entirely practical for a wide range of castings:

1. Light castings. (This expression includes the lightest castings which require risers. Obviously, it does not apply to very thin sections and very light castings which do not require feeding in the normal process of manufacture.) Square necks should be ½ to ¾-in. square—round necks 13/16 to ⅞-in. diameter.
2. Medium castings. (Should include castings from 50 to 300-400 lb.) Square necks should be 1 to 1¼ in. square; round necks 1-3/16 to 1-7/16 in. in diameter.
3. Heavy castings. (This includes castings up to those measured in tons instead of pounds.) Square necks should be 1½ to 2 in. square; round necks 1¾ to 2¼ in. in diameter.

Small Neck Is Adequate

Inasmuch as these dimensions constitute the only openings from the riser to the casting, or from the sprue to the casting, they may seem surprisingly small. However, they are adequate when the neck is proportioned properly, since the molding sand or the dry sand core surrounding this area of the feeder becomes sufficiently hot during the pouring process to act with the same effect as a much larger but longer neck used in the other types of feeding systems. Furthermore, it must be remembered that, in this method of gating, the metal in the riser is the hottest metal in the entire system and therefore does not require as large a feeding area as metal which is cold or partially frozen.

The shrink-bob riser is divided into two parts known as the "cope" bob and the "drag" bob. Both of these sections must be proportioned correctly.

The diameter of the shrink bob is determined by the size of the casting and the type of iron being poured. Obviously, larger shrink bobs are required for low-carbon, high-strength gray cast irons than for the softer, higher carbon irons. As a general rule, however, the proper size of the cross-sectional area of the shrink bob is from 60 to 80 per cent of the cross-sectional area of that section of the casting which requires the feeding. This general proportion may, and must, be altered by experience, tak-

ing into consideration the different solidification characteristics and the various masses of castings produced by the foundry using the feeder system. The correct method of determining the necessary changes is demonstrated in the accompanying table of defects and remedies. This table, which will be discussed later, is based on the experience of the authors, gained from gating thousands of different patterns with this system.

The cope bob or cope section of the shrink-bob riser must be at least 4 in. above the highest portion of the casting to develop sufficient static pressure of molten iron to obtain correct feeding. This cope bob may be either blind or open but, if it is open, it should be even more than 4 in. above the top section of the casting. If the cope bob is made blind (and this is the personal preference of the authors), it should be provided with an adequate venting or whistler system to permit rapid escape of the gases developed during the pouring process.

One of the most important features of the drag section of the shrink bob is the depth to which it extends into the drag. *It is extremely important that the drag bob extend below the neck of the riser sufficiently to ensure molten metal in that section of the riser directly opposite the neck!* If the drag bob is too shallow, or if it is omitted, the last portion of the riser to solidify will be fairly high up in the cope section of the riser and will be divided from the neck of the riser by solid iron. Furthermore, the drag section of the shrink-bob riser is necessary to provide sufficient heating of the sand surrounding the neck of the riser to maintain liquid metal during the period of feeding and solidification of the casting. *One of the principal failings of gating systems utilizing the principle of gating through the riser is the absence of sufficient depth of drag bob to provide proper relationship between the liquid metal in the riser and the liquid metal in the casting!*

The design of the runner connecting the down sprue to the shrink bob is nearly as important as the design of the shrink bob itself. After all, in this type of gating system, the runner connecting the sprue and the shrink bob is really the gate, except that in this case the gate enters the riser and not the casting. The runner or gate must provide a choke immediately in front of the shrink-bob riser in order to obtain the necessary swirling effect and cleansing of the metal in the riser. Furthermore, it is important that the gate or runner enters the shrink bob tangentially, and that it be sufficiently large to provide a rapid whirlpool effect within the riser bob to keep the dirt flowing in the very center of the shrink bob. Only three sizes of runners or gates are used for castings ranging from 10 lb to 2 or 3 tons. These three sizes are sufficient to provide correct directional solidification characteristics when the shrink-bob riser system is correctly designed.

The down sprue itself should be at least 1.2 times as large as the minimum cross-sectional area of the gate or runner. It is usually preferable to use even a larger sprue, with a ratio of 1.4 to 1.6 times the cross-sectional area of the gate or runner at its smallest dimension. Sometimes the sprue is made even larger, (*Please turn to Page 220*)

Casting Defects and Remedies Applied to the Shrink-Bob Riser System

Defects	Remedies
1. Dirty castings	1. Pouring sprue must be kept full of iron during entire pouring period. Maximum pressure is required in order to obtain rapid whirlpool effect in shrink bob. Therefore, dirty castings may be due to runner or gate being too small in relation to neck of shrink bob, or sprue being smaller than runner. Dirt may also be encountered if runner does not enter bob tangentially and in proper relation to the neck.
2. Shrink holes at neck into the casting.	2. Increase diameter of shrink-bob riser or cross-sectional area of neck.
3. Open iron in casting adjacent to the neck.	3. May be caused by excessively large neck and riser resulting in slow cooling and large graphite flakes. Decrease size of neck or riser, or both.
4. Pull down of metal on cope side of casting.	4. Shrink bob is either too small in diameter or insufficiently high to establish necessary static pressure of molten iron.
5. Internal shrinkage	5. Same as 4.

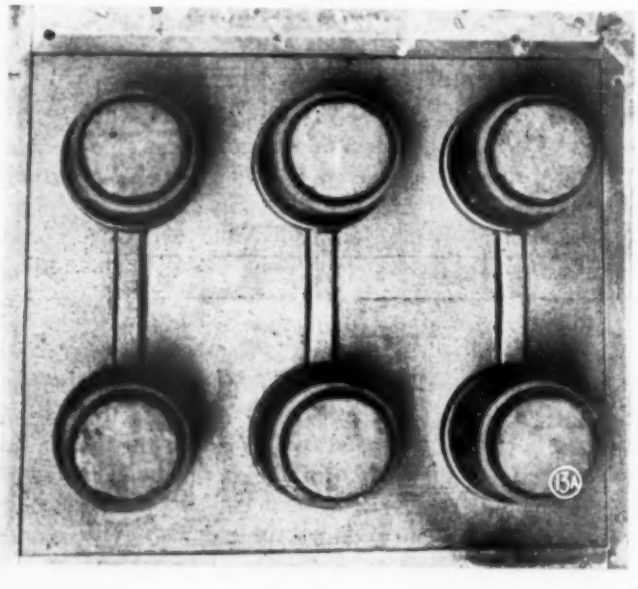
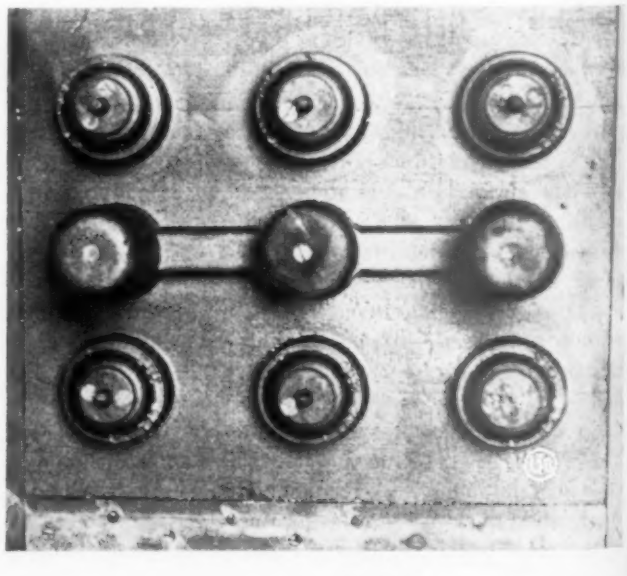


Fig. 13—Unsatisfactory type of pattern used for same job as pattern shown in Fig. 12. Incorporates no drag bob, and neck is inadequate to feed heavy boss section satisfactorily, resulting in excessively porous seat



United States and Canada Have 5569 Foundries

REFLECTING heavy war demands for castings, the number of foundries in operation in the United States and Canada increased by 274, or approximately 5 per cent, during the past two years, according to statistics compiled from the 1945-46 edition of *Penton's Foundry List* recently published by the Penton Publishing Co., Cleveland. Number of active foundries in the United States now is 5048, compared with 4802 in 1943, while the Canadian total has increased to 521, against 493 two years ago.

Geographical distribution of the various types of foundries is shown in the accompanying table. It should be kept in mind that the figure shown in each case for "Total Foundries" represents the number of individual plants but is not the sum of each of the different types of foundries listed, since many foundries produce more than one kind of casting in the same plant.

Since 1943, when the last tab- (*Please turn to Page* 185)

Distribution of Foundries in the United States and Canada

	Total Foundries 1945	Total Foundries 1943	Gray Iron Foundries 1945	Gray Iron Foundries 1943	Steel Foundries 1945	Steel Foundries 1943	Malleable Foundries 1945	Malleable Foundries 1943	Total Nonferrous Foundries 1945	Total Nonferrous Foundries 1943	Exclusive Nonferrous Foundries 1945	Nonferrous Foundries Dept. of Other Shops 1945	Brass and Bronze Foundries 1945	Aluminum Foundries 1945	Magnesium Foundries 1945	Centrifugal Casting Producers 1945	Permanent Mold Casting Producers 1945	Machine Shops 1945	Pattern Shops 1945	Laboratories 1945
Alabama	86	90	78	80	6	6	3	3	27	21	5	22	18	21	1	4	7	63	69	18
Arizona	7	7	5	7	2	3	..	..	6	4	2	4	5	4	..	..	3	3	7	..
Arkansas	18	18	13	15	1	1	..	..	12	8	3	9	8	8	..	..	..	12	..	1
California	392	331	149	136	37	30	3	2	280	186	226	54	189	215	14	14	51	158	216	91
Colorado	45	39	22	20	6	4	..	1	25	18	18	7	23	20	..	2	6	22	26	9
Connecticut	133	126	51	56	4	5	7	8	91	87	69	22	75	59	..	1	7	63	69	40
Delaware	13	11	5	6	3	3	1	1	8	7	3	5	7	6	..	..	1	9	10	4
Dist. of Columbia	2	2	2	2	2	1	..	..	2	2	..	2	1	2	1	1	1	2	2	2
Florida	35	33	22	24	2	1	1	..	26	28	7	19	30	27	..	..	2	27	30	5
Georgia	76	70	64	61	5	3	..	..	44	34	9	35	32	32	..	1	3	47	62	5
Idaho	5	6	5	5	..	1	..	..	4	5	..	4	4	3	..	..	..	4	4	..
Illinois	392	373	194	204	25	25	20	18	220	185	169	51	162	166	11	11	25	188	236	125
Indiana	220	210	130	126	14	12	9	10	120	106	73	47	85	94	5	9	10	102	129	65
Iowa	89	80	65	59	5	5	1	2	42	37	15	27	32	40	..	1	2	44	58	29
Kansas	48	49	39	41	1	1	1	..	27	25	8	19	19	23	..	1	2	31	40	11
Kentucky	37	36	26	24	1	..	..	..	23	19	10	13	22	13	1	1	2	22	25	6
Louisiana	35	33	24	24	5	5	..	..	22	25	8	14	21	13	..	1	2	21	25	6
Maine	24	24	21	22	..	..	1	..	16	15	2	14	14	12	..	..	..	14	20	2
Maryland	46	44	30	31	4	..	..	1	30	25	14	16	27	21	1	3	1	29	28	10
Massachusetts	216	207	104	114	11	8	3	3	144	133	100	44	133	105	3	7	9	81	120	47
Michigan	355	336	180	176	26	23	12	10	226	193	155	71	166	152	15	27	35	167	200	133
Minnesota	105	100	75	73	3	3	1	1	54	45	26	28	47	45	1	2	7	55	64	25
Mississippi	13	13	12	12	1	1	..	..	8	10	..	8	7	5	..	..	1	9	9	2
Missouri	106	104	55	59	10	12	2	1	58	50	43	15	45	50	1	4	7	56	66	31
Montana	8	8	8	8	..	..	..	..	6	6	..	6	6	1	..	..	1	7	7	..
Nebraska	23	19	14	14	2	1	1	..	18	13	7	11	16	15	..	1	..	17	15	2
Nevada	3	3	3	3	1	..	..	..	3	3	..	3	3	..	..	..	..	1	2	1
New Hampshire	22	23	13	15	2	2	2	1	16	16	7	9	16	12	..	2	1	15	15	2
New Jersey	187	172	83	81	13	7	2	2	123	104	90	33	97	85	7	9	9	90	115	44
New Mexico	1	1	1	1	..	..	..	..	1	1	..	1	1	..	..	..	..	1	1	..
New York	408	398	194	203	26	22	13	14	286	249	183	103	227	222	7	22	27	224	276	106
North Carolina	60	65	54	60	1	..	..	..	29	34	4	25	23	25	..	..	3	38	46	2
North Dakota	4	4	3	3	..	..	..	..	3	3	1	2	3	2	..	..	..	3	3	..
Ohio	522	503	279	279	36	34	21	17	288	266	202	86	210	213	13	21	39	264	330	177
Oklahoma	35	40	25	28	2	1	..	..	22	21	9	13	15	18	..	..	..	24	27	3
Oregon	55	50	36	35	10	6	..	..	29	24	9	20	25	17	..	..	2	26	36	15
Pennsylvania	532	519	327	328	60	61	17	16	300	258	149	151	246	192	2	20	27	323	388	156
Rhode Island	40	38	19	18	1	..	3	2	27	24	19	8	26	21	..	2	1	13	26	7
South Carolina	24	21	21	20	..	..	..	..	18	16	2	16	16	14	..	..	..	18	19	4
South Dakota	2	3	2	3	..	..	..	..	1	2	..	1	1	..	..	..	..	1	1	..
Tennessee	73	72	64	63	1	1	..	..	32	30	8	24	24	19	1	..	2	49	56	15
Texas	113	108	69	69	11	10	1	..	72	60	28	44	59	50	1	5	2	59	76	28
Utah	20	18	17	14	1	1	..	..	12	10	3	9	10	10	..	..	1	11	13	6
Vermont	18	16	15	14	..	..	1	..	6	5	2	4	5	5	..	..	2	13	11	2
Virginia	69	68	62	64	4	2	..	..	44	42	4	40	40	29	..	3	3	48	48	12
Washington	90	85	51	49	19	18	1	1	60	53	30	30	54	43	1	..	5	32	55	22
West Virginia	38	38	24	26	2	2	1	1	24	24	9	15	23	11	..	1	6	25	30	8
Wisconsin	201	186	123	114	16	14	11	11	103	98	63	40	85	80	3	11	19	96	120	68
Wyoming	2	2	1	1	1	..	..	..	2	1	1	1	2	..	..	..	..	2	1	1
Total	5048	4802	2879	2890	383	335	139	126	3040	2631	1795	1245	2329	2210	89	187	336	2629	3232	1348
Alberta	15	12	12	10	1	1	..	..	14	10	3	11	11	10	..	1	3	13	14	4
British Columbia	58	55	44	41	9	8	1	1	44	39	14	30	40	29	1	1	3	30	48	13
Manitoba	19	17	14	10	3	2	..	..	13	8	4	9	8	12	..	..	..	12	17	5
New Brunswick	11	9	9	8	..	..	..	..	9	6	1	8	8	7	..	..	1	7	10	1
Newfoundland	4	5	4	4	1	1	..	..	4	4	..	4	3	4	..	..	..	2	4	2
Nova Scotia	24	23	21	21	2	2	..	1	15	16	1	14	15	8	..	..	2	16	19	2
Ontario	260	255	169	174	9	9	13	11	174	134	78	96	132	136	1	10	14	173	201	59
Prince Edward Island	3	4	3	3	..	..	..	..	2	2	..	2	2	1	..	..	..	2	2	..
Quebec	119	106	72	66	11	11	3	2	78	56	31	47	71	70	1	8	12	74	87	33
Saskatchewan	8	7	7	6	..	..	..	..	5	3	..	5	5	4	..	..	..	6	7	..
Total	521	493	355	343	36	34	17	15	358	278	132	226	295	281	3	20	35	335	409	119
Total U. S. and Canada	5569	5295	3234	3233	419	369	156	141	3398	2909	1927	1471	2624	2491	92	207	371	2964	3641	1467

BRITISH WARTIME FOUNDRY D

Because of the keen interest in the United States in developments by the British foundry industry, THE FOUNDRY invited a number of the leading foundrymen of Great Britain to prepare reviews of the accomplishments in their particular fields during the wartime period. Three of these reviews appear here. Articles discussing developments in research work and foundry mechanization will be published in the September issue

Organization of the Iron foundry Industry

By VINCENT DELPORT

THE main development in the internal organization of the iron-foundry industry brought about in Great Britain by the war was reported in THE FOUNDRY of December, 1941. In September of that year the Council of Ironfoundry Associations was formed with the main object of representing the industry in negotiations with government departments. The council grouped together practically all the existing trade associations that had, until then, operated separately, preserving the complete autonomy of these associations in so far as their sectional interests were concerned, but making for national representation where the major interests of the industry were concerned.

Since its formation, the council has cooperated with the government departments and safeguarded the interests of the industry in such matters as manpower requirements, utilization of raw materials, fuel conservation, education and training of apprentices. In certain cases, technical collaboration with the government was achieved with the assistance of the Institute of British Foundrymen and of the British Cast Iron Research Association, both of which organizations are affiliated with the council and are represented on the council's technical committee.

Negotiations with the Board of Trade on the subject of concentration of the industry took place in 1942 and 1943 and, as reported in THE FOUNDRY in May 1943, it was finally decided not to proceed with concentration, owing to the particular nature of the industry.

Throughout the three and a half years of its activities, the council has proved its worth. Its influence has been increasingly felt both inside and outside the industry, and there is no doubt that it has come to stay. It is recognized by government and other high authorities as the one organization that can represent the views of the industry, and such authorities consult with the council on matters of national or major importance that concern the industry.

During recent months, consultations have taken place, mainly with the Ministry of Supply, with regard to plans for postwar reconstruction, the more immediate concern being the period of transition from war production to peace-time production.

In viewing the postwar prospects of the industry, it should be borne in mind that certain sections, principally those concerned with munitions, engineering, marine and shipbuilding and machine tools, have kept active during the war years, whereas other sections, particularly those concerned with the building trade, have experienced a very lean time. The industry as a whole, even those sections engaged on war work, has been severely handicapped by shortage of manpower.

It is estimated that the postwar demand for iron castings of all kinds will be between 15 and 20 per cent higher than the annual output of the years immediately preceding the war, which amounted to some three million tons, and that the capacity of production of British foundries for producing this postwar tonnage is available. However, it will be necessary for certain essential requirements to be met before an even flow of peacetime production can be achieved. These requirements are mainly in regard to supply of labor, especially skilled molders and apprentices; re-adaptation of foundries to peacetime production and

DEVELOPMENTS

Vincent Delport has been European manager of THE FOUNDRY since 1924, when he assumed charge of the Penton Publishing Co. Ltd., London, European subsidiary of the American company. He was appointed European representative of the AFA in 1925, and has been a member of its International Relations Committee for many years. Mr. Delport was born in London, educated in France and served with the French army during World War I. After the war he was associated for a time with the United States Steel Products Co. in New York and Paris, and later was engaged as a consulting engineer and manufacturers' agent in the latter city. A past president of the International Committee of Foundry Technical Associations, Mr. Delport is a member of various technical societies of Great Britain and France.

repairs and replacement of plant and machinery; supplies of raw materials. A number of foundries that were destroyed or damaged by enemy bombing will also have to be reconstructed speedily.

Plans for demobilization are made, and the return of men to the various industries and trades is to be proceeded with on a priority basis, giving precedence to those industries and trades that are of the greatest importance to national reconstruction and the revival of export trade. High priority should be given to the ironfoundry industry owing to its being a basic industry. In the field of national reconstruction special consideration is likely to be given to the light castings section because of the vital importance of the rehousing scheme. In regard to export trade, iron foundries will also play an important part since castings are an essential part of built up products.

Government Control Will Continue

Replacement and repairs of plant and equipment, the readaptation of foundries to peacetime production and rebuilding of destroyed and damaged foundries, are all dependent upon the availability of materials for reconstruction and machinery. While the war lasted the strictest control continued to be exerted by the government on all such supplies, although the control on the purchase of machine tools was relaxed. For some time after the end of the war control will continue because of the enormous potential demand for all kinds of plant, equipment and materials from British industries as a whole, and here again, priorities and quotas will be the rule. For the same reasons as those advanced in regard to labor, the foundry industry should come in the first ranks for the fulfillment of its requirements.

Similar reasonings apply to the provision of the actual raw materials used in the foundry, but in this respect the difficulties should not be so great, although the requirements for scrap may be somewhat embarrassing, and supplies of hematite iron may only gradually be made available in sufficient quantities.

On all these matters, and others of lesser importance, the industry has made its requirements known to the government, through the Council of Ironfoundry Associations.

The industry itself is prepared to play its part and shoulder its responsibilities in the work of reconstruction, on the assumption that the government will give its assistance, make known its postwar policy and remove as soon as possible the controls and restrictions which, at present, restrain the industry.

A preliminary estimate of the cost to the industry of bringing its schemes for development, modernization and expansion to fruition shows that between 25 and 30 million dollars will be necessary, this amount to be spread over the next few years. This money will be required to bring the industry to a high pitch of efficiency by replacing obsolete plant and introducing modern methods of production. A relatively large proportion of the amount to be spent will go toward mechanization. It is realized in this connection that the scope for mass production methods in Great Britain is not unlimited. The jobbing foundry plays an important part in the castings industry of this country, and certain local requirements, depending upon geographical features or the nature of local industries, can best be met by relatively small jobbing foundries specially adapted to such local needs. It is recognized, however, that under modern conditions of production and in order to withstand competition, jobbing foundries, even if comparatively small in size, must be highly efficient, and therefore they should adopt mechanical means of production and labor saving methods to the full extent where such means and methods are applicable to their operations.

Production methods have, of course, made considerable strides in Britain during the war, and in this direction the development of full mechanization, including in some cases continuous methods of production, is envisaged by an increasing number of large firms. Some of the schemes being contemplated will call for an expenditure of two or three hundred thousand dollars, reaching in a small number of individual cases as much as half a million dollars.

Another direction in which the industry may strive toward greater proficiency is in respect of rationalization. Already before the war certain firms engaged on similar lines of production had merged into one group, thus making it possible to concentrate the production of certain types of casting in one foundry. (*Please turn to Page* 158)

BRITISH WARTIME FOUNDRY DEVELOPMENTS

Metallurgy of Iron and S

By DR. J. E. HURST

THE FOUNDRY industry is one of the industries concerned with the conversion of metals and alloys into useful shapes and articles, and utilizes the method of casting metals and alloys into molds previously formed to the shapes desired. It thus embraces the preparation of suitable metals and alloys, the conversion of these to the molten state, the production of molds and castings, their subsequent treatment, inspection, and testing. A review of the developments in Great Britain during the war can be dealt with very well under the headings—(1) metallurgy, (2) melting technique, (3) molding and casting technique, (4) heat-treatment, (5) inspection and testing.

Metallurgy. Range of steel casting alloys extends from the plain carbon steels to highly alloyed steels and includes the nickel-chrome-molybdenum hard armor steels, the austenitic, manganese and stainless steels, the heat-resisting and magnet steels, and the cast high speed steels. Increased demand for all types of steel castings, and restrictions on alloy supplies have been responsible for the need for vigorous conservation in the use of alloy additions. The view can be taken that one of the important developments in the steel foundry has been this conservation of alloys brought about by the careful review of existing composition specifications and the strict utilization of each grade of alloy steel in relation to its individual properties and characteristics.

Foundries Adjusted To Changed Conditions

In the field of cast iron metallurgy arising out of the need to conserve low phosphorous materials such as hematite, steel scrap and refined iron, foundrymen were expected to use as much of the native high phosphorous irons as possible. Up to the present there is little evidence that castings have suffered from the curtailment of supplies and, on the whole, foundries have adjusted themselves very satisfactorily to the altered conditions.

The Cast Iron Subcommittee of the Institute of British Foundrymen, in their report on meeting the raw materials supply position in gray iron foundries[1], collected the experiences of various foundries in dealing with problems arising from the changed raw materials supply position. They were able to give a number of examples from actual practice, and to make suggestions for meeting conditions of further stringency in supplies. The restrictions in low-phosphorous materials have largely been met by:—

(a) Substitution of hematite by low-phosphorous blast furnace pig iron with phosphorus about 0.4 per cent, resulting in a general increase in phosphorus. If the proportion of hematite in the charge did not exceed 30 per cent, the resulting increase in phosphorus was only about 0.1 per cent, and this rarely caused any difficulty.

(b) Replacement of hematite by refined pig iron. Low-phosphorous pig iron is obtainable at a premium, and it has been possible to maintain castings at the same phosphorous level as before, while at the same time dispensing with the use of a certain amount of steel scrap. The use of very low-phosphorous refined pig iron is discouraged, and a slight increase in phosphorus, as indicated in (a), can be tolerated.

(c) Very careful control over the metal mixture, especially over carbon and silicon contents, whereby the deleterious effects of phosphorus on mechanical properties may be eliminated or counterbalanced. The use of late silicon additions is strongly recommended.

(d) By giving careful attention to improved methods of running and risering—e.g., by the increased use of feeding heads, by the adoption of new running methods of incorporating "atmospheric feeding," and special types of feeder gates.

(e) By adopting centrifugal casting methods wherever practicable.

(f) By careful attention to pouring temperature.

Alloys being added to electric arc furnace at British plant. (*British Information Services Photo*)

...nd Steel for Castings

Dr. J. E. Hurst, well known internationally in the foundry industry through his authorship of various books and papers on metallurgical subjects, is technical director of Bradley & Foster Ltd., Darlaston, England. A past president of the Institute of British Foundrymen, Dr. Hurst also is chairman of the Research Committee and member of the Executive Committee of the British Cast Iron Research Association; member of the board of the faculty of metallurgy, Sheffield University; president of the Staffordshire Iron & Steel Institute, and a member of various scientific bodies. He has been closely associated with development of the centrifugal casting process in Great Britain, formerly as manager of the centrifugal casting department of Newton Chambers & Co. Ltd. and later as technical director of Sheepbridge Stokes Centrifugal Castings Co. Ltd.

(g) By the correct use of denseners.

Ladle Metallurgy. The strong recommendation given in the report to the practice of late silicon additions serves to draw attention to this important development in iron founding practice. The terms "ladle additions," or "late additions," used in reference to adjustments in the composition of cast iron, in a sense are alternative and in a narrow sense; and including the term "inoculated" they refer to the treatment of molten cast iron in the ladle by the addition of elements which bring about graphitization. The general phrase, "inoculated cast iron," is now widely used and understood, and in the broadest sense refers to those cast irons in which the desired properties have been obtained either wholly or in part by the addition of some element or alloy to the molten metal in the ladle.

Justification for the use of a special term for cast irons so treated rests on the discovery that the action of graphitizing elements, such as silicon, is different when added to the already molten metal in a crushed form than when included with the pig iron and scrap, and melted down in the cupola charge. The effect produced by late additions of silicon in a suitable form to a molten white iron is so pronounced, having regard to the quantity added, as to fully justify the special use of the term "inoculation" to identify this procedure, for as a procedure it yields the highest strengths yet available from gray irons tested in the as-cast state.

It is of some importance to stress the fact that the production of such irons involves a process or a procedure, and in its application to the production of high-duty cast irons it is necessary that this should be carefully planned and carried out[2 3].

Prefer Granular Form Ferrosilicon

Summarizing what has already been published, the subcommittee recommended that between 0.5 per cent and 1.0 per cent silicon should form the late addition, irrespective of the amount of silicon in the metal as charged to the furnace. While early practice favored the introduction of ferrosilicon in powder form, granular form of pea size or even larger is now preferred. This preference, however may depend to a certain extent on the silicon content of the ferrosilicon readily available. It is usually considered that the powder form is quite effective when high-silicon ferrosilicon is being used, as the bulk to be added is not very great. With ferro-silicons of lower silicon content, it is better to use pea-size material.

Inoculation should take place as late as possible since its beneficial effect disappears after an interval of 15 to 20 min. Where fairly large quantities of metal are being treated, silicon treatments should be so arranged that the late addition is made near the end of the last tap, so that not more than, say, 10 minutes elapses between the completion of the silicon treatment and the pouring of the last mold from that particular batch of metal.

High Duty Inoculated Cast Irons. The outstanding examples of inoculated cast irons for high duty requirements to meet the higher ranges of British Standards Institution Specification 687 are now well known as the grade of meehanite cast iron produced by the addition of calcium silicide to molten cast iron of predeter- (*Please turn to Page* 208)

BRITISH WARTIME FOUNDRY DEVELOPMENTS

Nonferrous Foundry

By FRANK HUDSON

A SERIES of minor developments of incalculable value to the British nonferrous foundry industry as a whole have occurred during the war, although there have been no outstanding developments in the full sense of the term. Generally speaking, advances have been made in the production of both copper-base and light alloy castings as a result of research on the one hand and from sheer necessity on the other. The problems created by the shortage of copper and tin, so far as the bronze founder is concerned, provide a good example of the latter point and a suitable start for this review.

Bronze and Gunmetal Castings. In the early stages of the war very large tonnages of high tin content gunmetal, such as that containing 88 per cent Cu, 10 per cent Sn, 2 per cent Zn, were required to meet Admiralty requirements for castings to withstand pressure, and some concern arose when it first became necessary to restrict the use of these alloys due to the shortage of tin. However, industry, the services and government departments got together under the guiding hand of the British Standards Institution and evolved a series of War Emergency British Standards specifically designed not only to reduce the tin content to a minimum but to permit the maximum use of available scrap.

These specifications have worked extremely well and quite apart from the economy effected in the consumption of nonferrous metals they have indirectly effected an actual improvement in the quality of castings produced. It has become more widely appreciated, for example, by both founder and user alike that leaded gunmetals and bronzes of the 86-7-5-2 and 85-5-5-5 type are more easily handled in the foundry than the lead-free high tin alloys such as 88-10-2 or 88-8-4 and permit pressure-tight castings of variable section to be more readily manufactured on a production basis[1]. The excellent work done by the British Nonferrous Metals Research Association[2] and the Tin Research Institute[3] during the war relative to the effect of melting conditions and gas in molten bronze is worthy of particular mention.

Brass Castings. Emergency Standards designed to utilize 100 per cent miscellaneous scrap also were introduced covering two grades of cheap cast brass for the founding of less important types of castings, but on the whole these have been a failure. When the specifications were originally drawn up it was anticipated that quantities of battlefield scrap would become available, but this did not materialize. Furthermore, the alloys were never popular in the foundry. In the field of high tensile brass no new developments of importance have come to light.

Fig. 1—High pressure hydraulic cylinder made of high tensile aluminum bronze—8.5-10.5% Al, 3.0-5.5% Fe, 3.0-5.5% Ni, 3.0% max Mn, balance Cu. (Photo courtesy T. M. Birkett & Sons Ltd.). Fig. 2—High speed marine propeller made of high tensile aluminum bronze. Note method of gating to avoid turbulence during pouring.

Progress

Frank Hudson, associated since 1937 with the research and development department of the Mond Nickel Co. Ltd., London, gained his foundry experience in the United States as well as in Great Britain. From 1925 to 1927 he was successively with the American Brake Shoe & Foundry Co., Chicago; Warren Foundry & Pipe Co., Phillipsburg, N. J., and the Wyoming Shovel Works. In 1927 Mr. Hudson returned to England to become chief metallurgist with Glenfield & Kennedy Ltd., Kilmarnock. He is an active member of the Institute of British Foundrymen and the Institute of Metals, past chairman of the Scottish Local Section of the latter and a past president of the Scottish Branch of the Institute of British Foundrymen. Mr. Hudson has contributed a large number of papers to various technical societies on foundry subjects, and in 1936 was awarded the Oliver Stubbs Gold Medal of the Institute of British Foundrymen for his researches on molding sands.

Special Alloy Castings. In addition to the introduction of the emergency standards just mentioned, further specifications were drawn up covering silicon bronze and aluminum bronze for alloys substantially free from tin with the direction that they could be employed with advantage for special purposes, providing castings were produced by manufacturers having experience of such alloys. Very few silicon bronze castings have been made in Great Britain during the war years but substantial developments have arisen in connection with aluminum bronze of the high tensile type containing 8.5 to 10.5 per cent Al, 3.0 to 5.5 per cent Fe, 3.0 to 5.5 per cent Ni, 3.0 per cent max Mn, 0.5 per cent max Zn, balance Cu, having an ultimate tensile stress of not less than 40 tons per sq. in. with a minimum of 12 per cent elongation. Large numbers of castings for high duty service such as high speed marine propellers, pump impellers, billets for extrusion and rolling, etc., have been made in this alloy with extremely satisfactory results. Production difficulties thought insuperable with aluminum bronze before the war have largely disappeared through the development of correct foundry technique[1]. Incidentally, it might be mentioned that substantial quantities of nickel aluminum bronze scrap in the form of bar ends and turnings from the aircraft industries have been remelted into ingots suitable for casting production. With a definite knowledge of this material, the foundryman can proceed with confidence.

(Photo courtesy Starkie-Gardner & Co. Ltd.). Fig. 3—Large chemical pan made of aluminum bronze—10% Al, 2% Fe, balance copper. (Photo courtesy Phosphor Bronze Co. Ltd.). Fig. 4—Cast monel pump body. Note surface finish from mold. (Photo courtesy Phosphor Bronze Co. Ltd.)

Light Alloy Castings. No revolutionary changes of a metallurgical nature such as the discovery of new materials have been evident in the field of light alloy castings during the war. Like the brassfounder, the maker of cast aluminum alloy products has given considerable attention to metal conservation, and here again possibly the most prominent development which has arisen is the use of secondary metal as a basis for the production of certain types of castings. Two specifications covering this matter have been issued by the Air Ministry, D.T.D.424 and 428, the former being the more extensively employed. The alloy is made up from approved "Y" Alloy, Alpax and Duralumin scrap and contains 2.0 to 4.0 per cent Cu, 3.0 to 6.0 per cent Si, 0.8 per cent max Fe, 0.7 per cent max Mn, 0.35 per cent max Ni, 0.2 per cent max Zn, 0.15 per cent max Mg, balance Al. When melted and sand cast in the normal way the properties are not outstanding, the specification only calling for a minimum of 9 tons (20,160 psi) tensile with 2 per cent elongation. However, by control of the composition, coupled with flux treatment during melting, followed by a suitable heat treatment, it has been found possible to raise the tensile strength to the order of 17 to 19 tons (38,000 to 42,500 psi). Considering this alloy is made entirely from scrap, the results so far obtained in practice are distinctly promising and it may well become of greater commercial importance in the postwar field. The British Nonferrous Metals Research Association, in conjunction with industrial laboratories, has completed useful investigations on many factors connected with the production of light alloy castings both in the older established alloys and those made from secondary material.

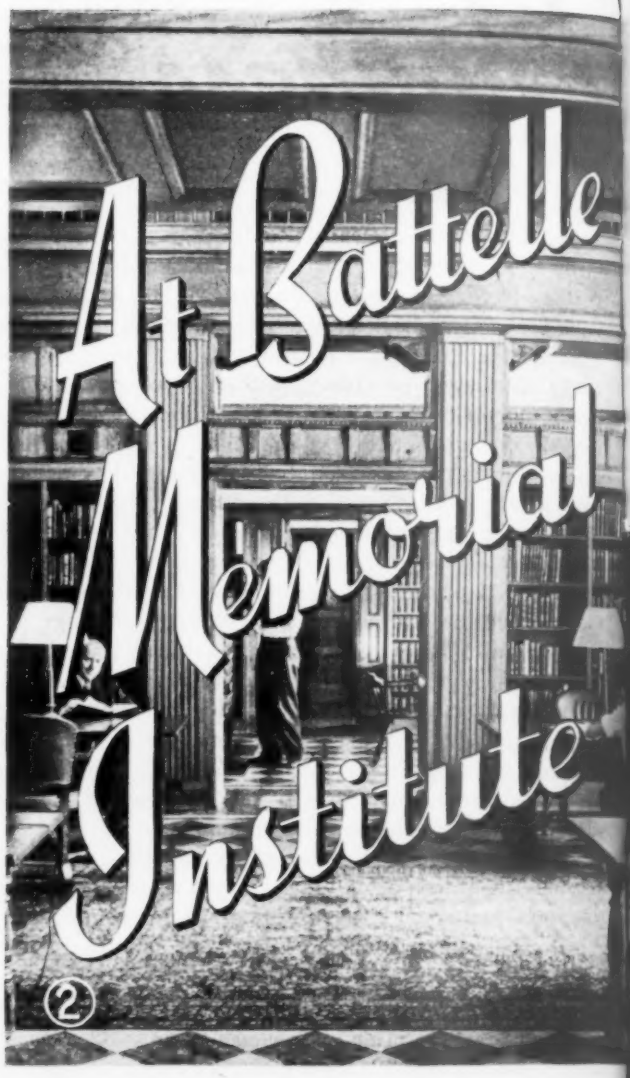
Methods of Production. Shortage of equipment and the fact that the main structure (*Please turn to Page* 163)

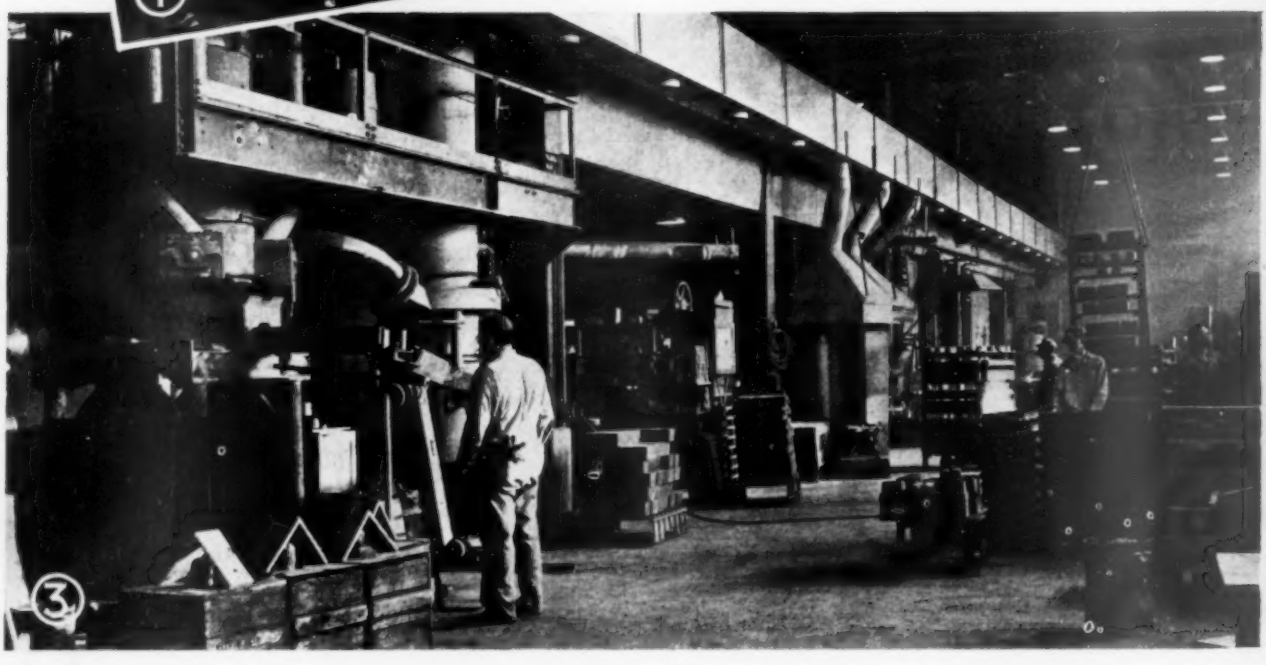
FOUNDRY RESEARCH—

This is the second of a series of articles describing some of the country's leading research facilities for the development of improved foundry practices and products. A description of the Naval Research Laboratory appeared in the July issue

By EDWIN BREMER
Metallurgical Editor
THE FOUNDRY

At Battelle Memorial Institute





DURING the past decade Battelle Memorial Institute, Columbus, O., has been engaged in conducting foundry research. For example, the Alloy Casting Institute, comprising a number of steel foundries specializing in heat resistant and corrosion resistant castings, has for a number of years sponsored co-operative research at Battelle for its members on the various problems connected with the manufacture of their products. Among these problems are selection of most suitable compositions, effects of the various alloying agents, melting and pouring practice, etc. A number of copper producers sponsored research on the effect of copper in gray iron and steel castings.

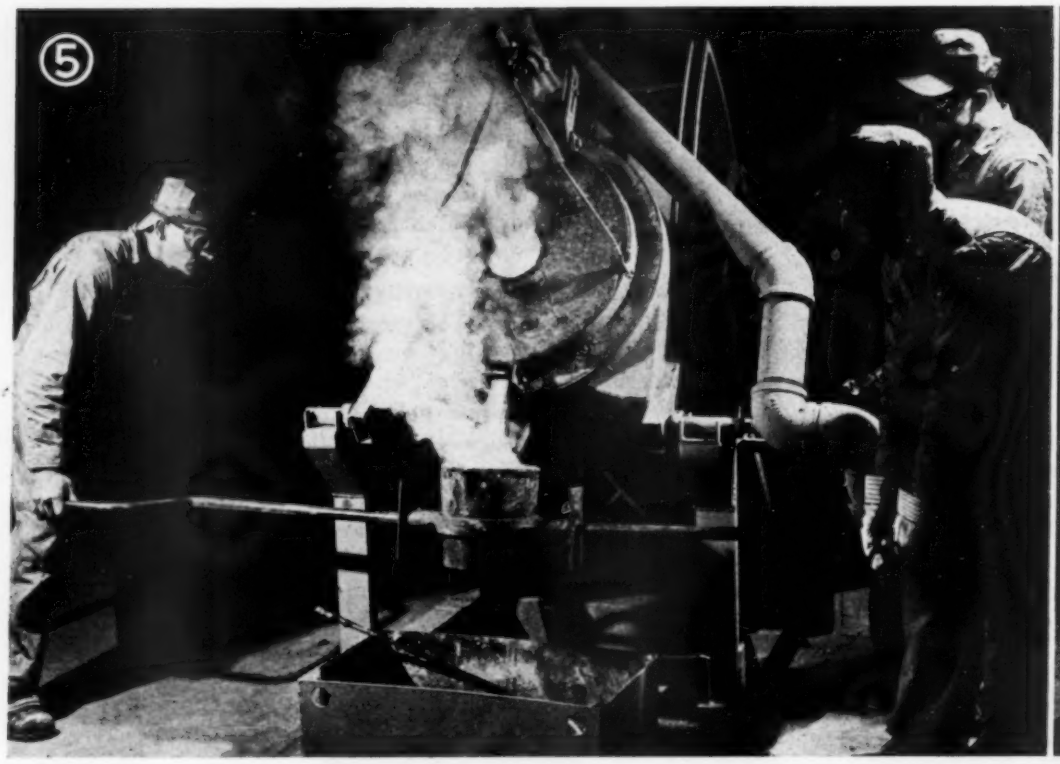
About 5 years ago 15 gray iron foundries joined together to finance a study of their problems and formed the Gray Iron Research Institute Inc. This organization includes foundries producing a wide variety of castings, including pipe, machine tools, piston rings, die blocks, automotive castings, light production, heavy jobbing, light jobbing and sanitary ware. The detail of operation in these plants is extremely diversified, but they have a common interest in improving the metallurgical quality of their product and their operational efficiency. Research work of that organization is conducted at Battelle, and is divided into two programs. One is concerned with immediate problems, or what may be termed short-range, and deals primarily with the improvement of the present types of gray iron. The other is a long-term program with a view toward developing superior types of gray iron, and methods of producing them uniformly and consistently.

Fig. 1—Making of castings is one of the phases of foundry research

Fig. 2—A well-equipped library of technical books and periodicals aids in the search of literature

Fig. 3—View of a portion of the foundry department showing some melting and heat treating equipment at the left. Molding and pouring is performed at the right

Fig. 4—Tapping one of the small or baby type cupolas. Various types of equipment can be attached to the cupolas to provide close control and determine the operating conditions



Studies involved in the short-term program include such phases as iron temperature control, coke quality tests and cupola refractories in connection with cupola operation; gating and risering, ladle refractories and improvement of casting finish as related to foundry practice; and commercial inoculants, effect of pouring temperature and effect of sulphur on casting quality in connection with metallurgy. The long-term program has under consideration such studies as the basic lined cupola, slag control, new types of coke, new mold materials, mold coatings, new inoculants, tougher irons, and new iron compositions.

Although most of the improvements developed for the Gray Iron Research Institute Inc., are confidential to the supporting members, information of a fundamental nature is presented to the industry in the form of articles in the technical press, papers presented at association and group meetings, etc. A large percentage of the research activity of the group is conducted in the plants of member foundries by the Battelle Memorial Institute staff assigned to this study. In this way, an optimum balance of theory and practice is maintained. Also, this technique permits rapid adoption of laboratory developments by the commercial foundries and avoids loss of efficiency in correlating practical problems with fundamental metallurgical advances.

Study Effect of Gases on Copper-base Alloys

Within the past few months, under the sponsorship of the Nonferrous Ingot Metal Institute, the process metallurgy laboratories of Battelle began a study of gases and other factors affecting the soundness of castings made from copper-base alloys. Objective of the research is a study of the factors in production which promote soundness and good physical and mechanical properties of brass and bronze castings. In addition to those groups various governmental agencies, including the National Advisory Committee for Aeronautics, the Army, the Navy, War Production Board, and the Office of Scientific Research and Development, are sponsoring research at-laboratories of the institute.

While, as might be expected, much of the research conducted at Battelle has been of a confidential nature, a considerable amount of information pertinent to the foundry field has been made available through the technical press and papers presented at society meetings. The data cover a wide field, ranging from the theoretical aspects to the practical phases. Subjects discussed included freezing of gray iron, cast iron strength versus structure, effect of copper and preheat treatment on malleablization, effect of hydrogen on malleablization, undercooling of gray iron, formation of graphite, copper in cast steels, effect of alumium on cast steels, foundry teamwork, flowability of steel, cupola raw materials, hydrogen and nitrogen as causes of gassiness (*Please turn to page* 218)

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Fig. 5—Pouring metal from one of the nonferrous melting units

Fig. 6—Taking a heat of steel from one of the electric arc furnaces which also can be used for melting cast iron

Fig. 7 — Metallographic examination of specimens aids in solving many problems

Fig. 8—Pouring gray cast iron

Fig. 9—Partial view of the physical testing laboratory

Fig. 10—Making some magnesium castings

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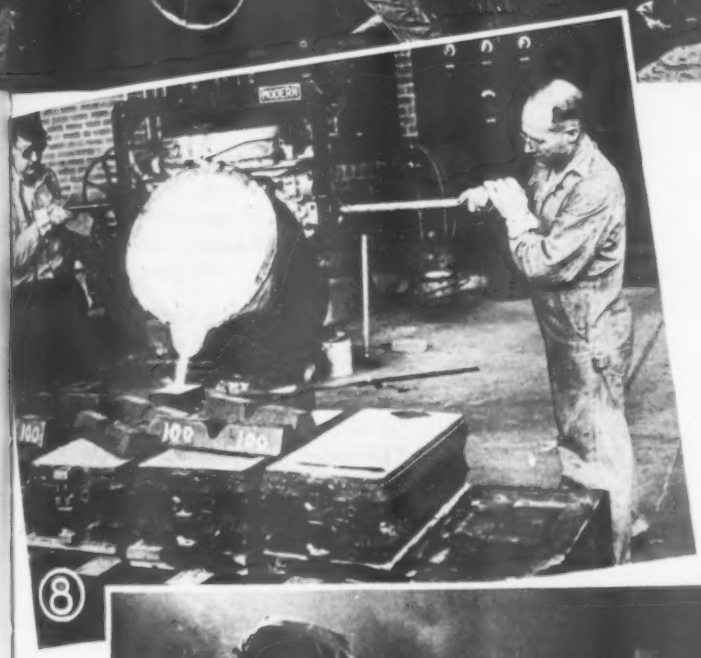
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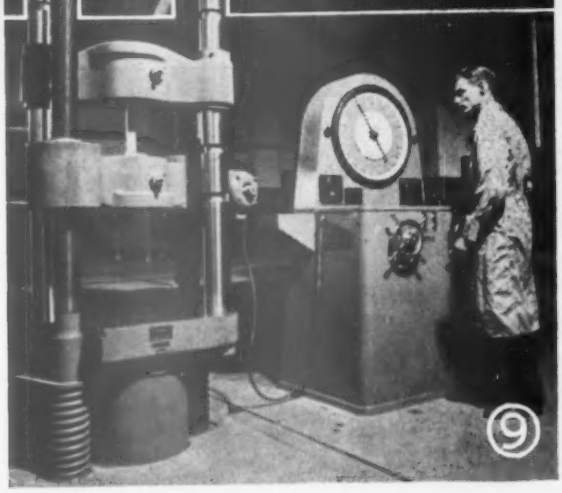
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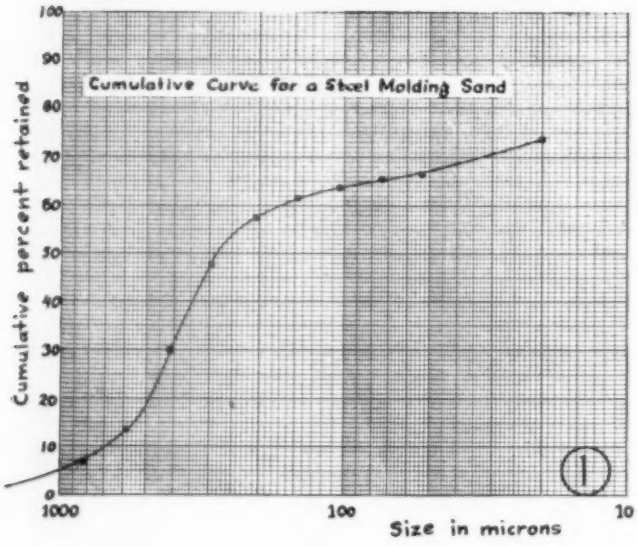
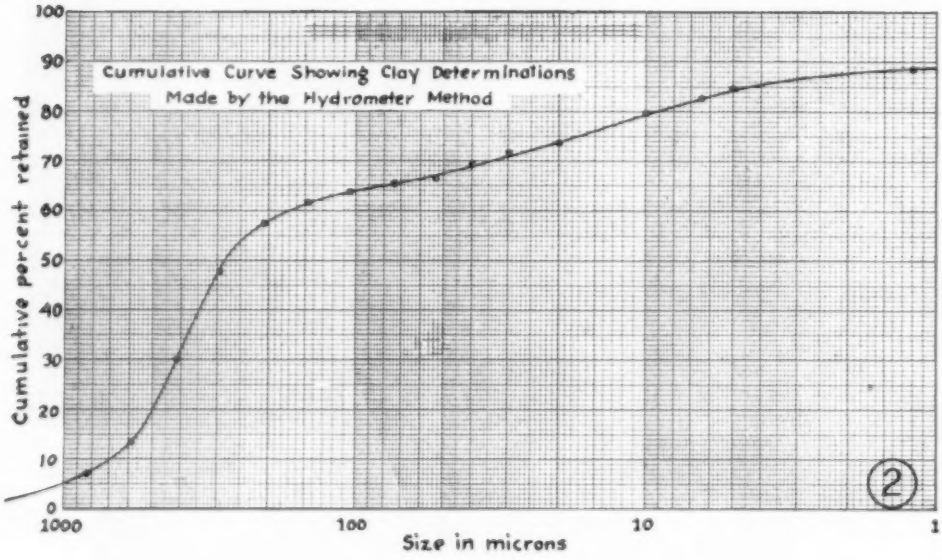
The Cumulative Curve for FOUNDRYS

The technique described here for evaluating foundry sands and other particulate foundry materials is intended to facilitate and improve control over the materials and provide a basis for adequate specifications governing their purchase. Because it opens a new approach to the classification of sand, clay, silica flour, etc., this discussion is presented in order to stimulate wider study of the entire subject





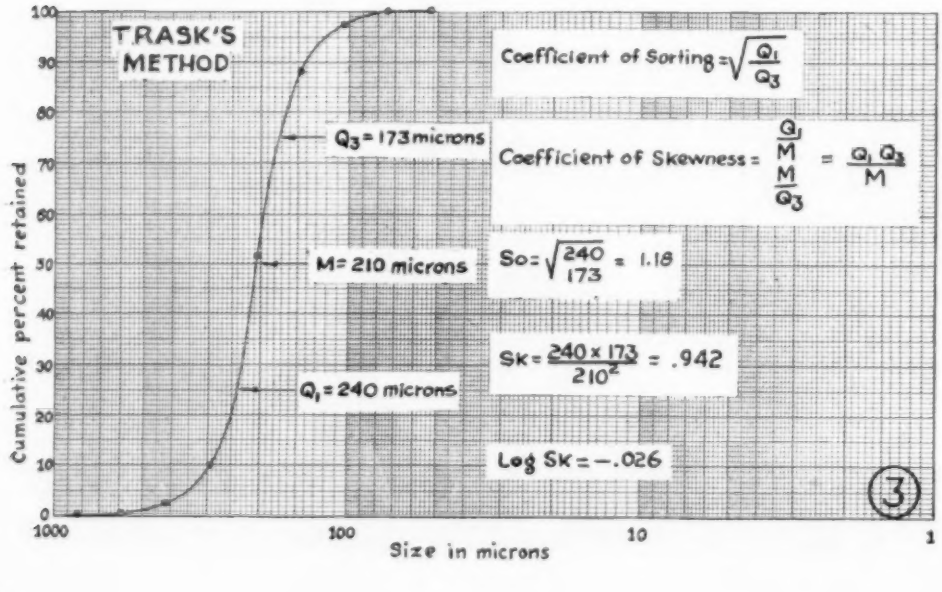


Fig. 1—Cumulative curve for a steel molding sand showing particle size—expressed in microns—and distribution

Fig. 2—Cumulative curve showing clay determinations made by the hydrometer method

Fig. 3—Illustrating method employed by Trask in determining distribution of particle size

By ROBERT E. MOREY and HOWARD F. TAYLOR
Steel Castings Section, Division of Physical Metallurgy
Naval Research Laboratory, Washington

SAND CONTROL

THE present AFA method generally used for classifying molding sands does not give an adequate evaluation of their suitability as molding materials, in the opinion of the authors. Two sands which are identical, according to the AFA classification, may show entirely different molding characteristics. Moreover, castings produced in one sand will be sound and of good quality whereas castings produced in the other sand will contain porosity and have inferior surfaces. This is why it is often impossible to obtain check results between foundries supposedly using the same grade of sand, and why inconsistent results are often obtained in a single foundry purchasing batch lots of sand from a single sand bank or source of supply.

The problem, therefore, consisted of investigating methods of classifying sands and sediments which are used in other fields, to determine if they would help to overcome the deficiencies of the AFA method; also to modify and adapt the best of these methods to the grading of foundry sands and clays to the end that simple, accurate specifications could be developed for their purchase or designation as well as for their control. A satisfactory method should encourage development of knowledge in the silt-clay region, permit more accurate control of sand mixtures and raw materials, and permit the interchange of ideas

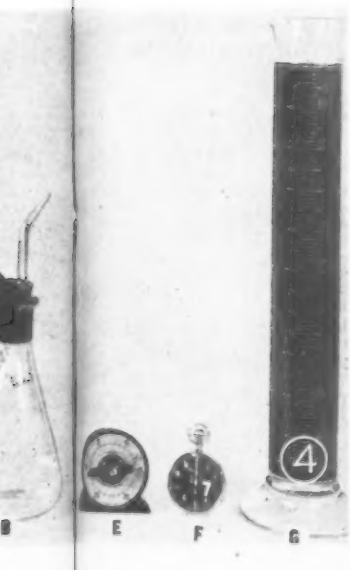


Fig. 4—Equipment used in hydrometer method for determination of sand particle sizes

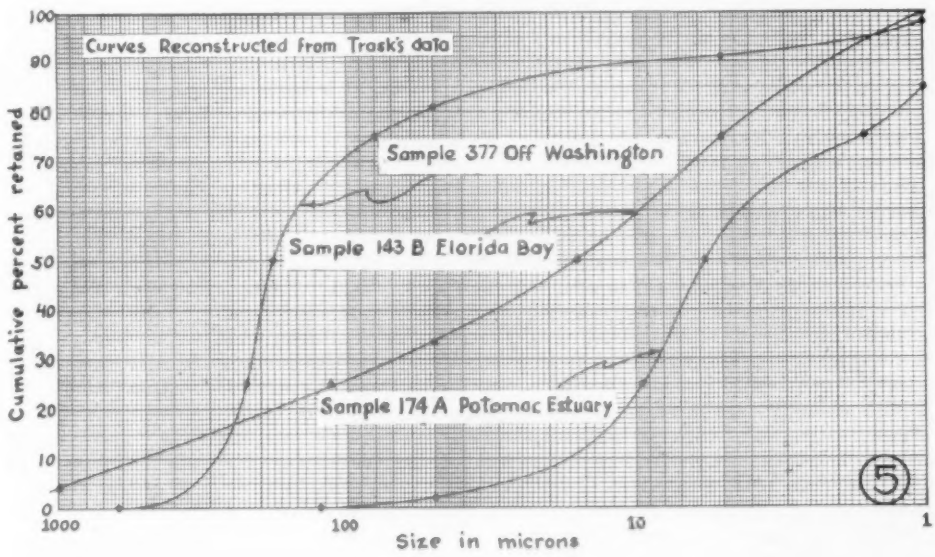
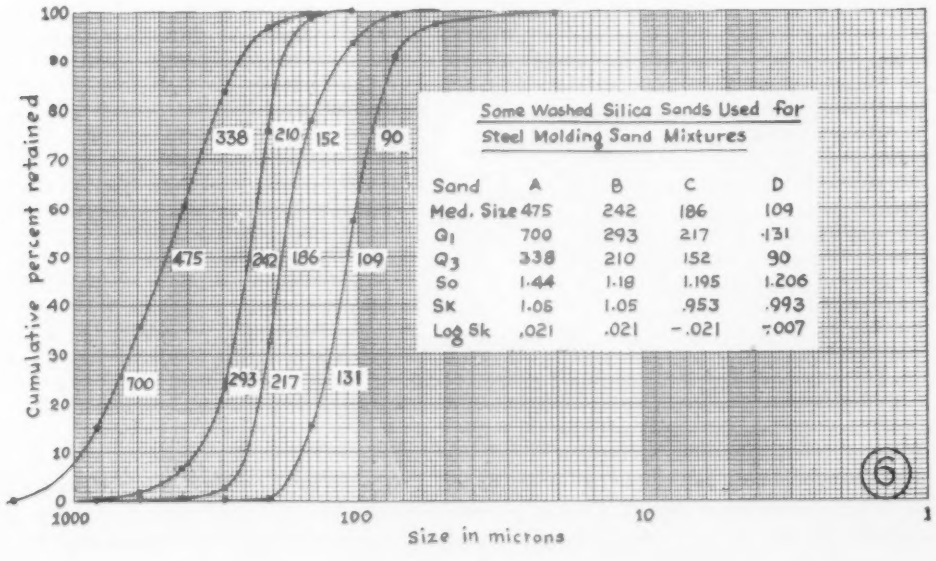
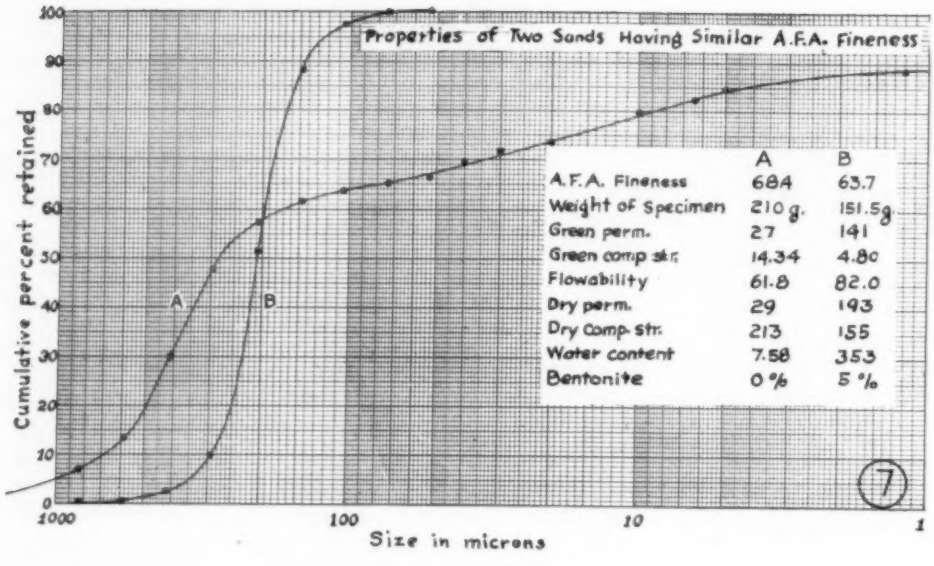
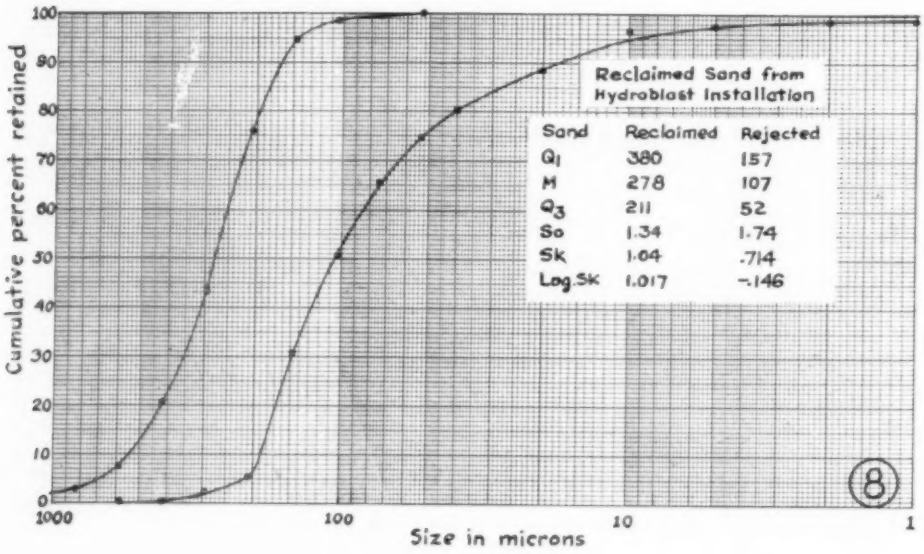


Fig. 5—Distribution curves for various natural deposit sands. Comparison of these curves with those of Fig. 6 indicates the outstanding differences between natural deposits and washed and graded sands







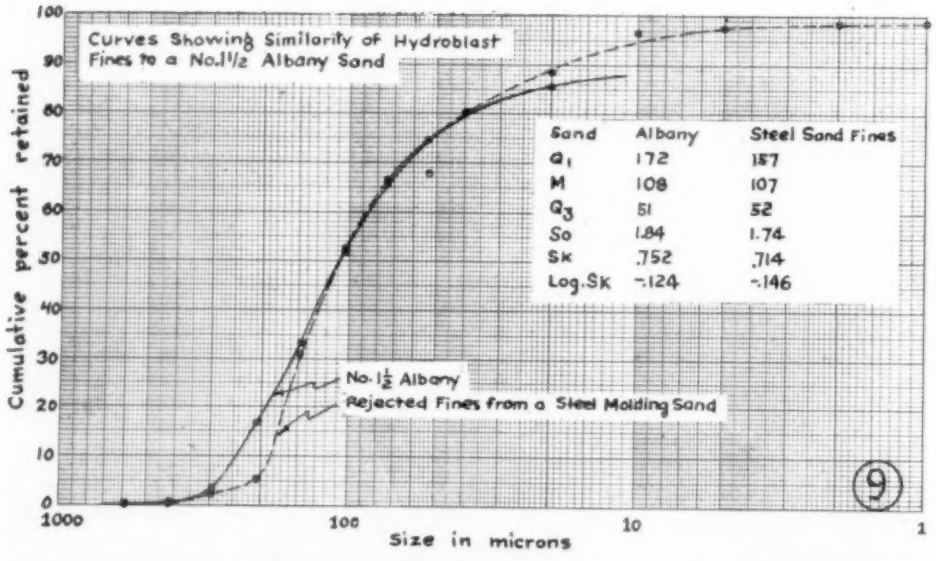


Fig. 7—Cumulative curves for two sands having similar fineness numbers but variations in physical properties. Fig. 8—Curves of reclaimed and rejected sand from hydroblast installation. Fig. 9—Showing similarity between Albany sand and fine sand from Fig. 8

TABLE I—FINENESS WITHOUT SILT OR CLAY

Sieve	% Retained	Multiplier	Product
6	.10	3	.30
12	1.20	5	6.00
20	5.60	10	56.00
30	6.28	20	125.60
40	16.72	30	501.60
50	17.76	40	701.40
70	9.68	50	484.00
100	4.30	70	301.00
140	2.00	100	200.00
200	1.44	140	201.60
270	1.04	200	208.00
	66.12		2785.50

AFA Fineness Number = $\frac{2785.50}{66.12} = 42.12$

TABLE II—FINENESS WITH SILT BUT WITHOUT CLAY

Sieve	% Retained	Multiplier	Product
6	.10	3	.30
12	1.20	5	6.00
20	5.60	10	56.00
30	6.28	20	125.60
40	16.72	30	501.60
50	17.76	40	701.40
70	9.68	50	484.00
100	4.30	70	301.00
140	2.00	100	200.00
200	1.44	140	201.60
270	1.04	200	208.00
Silt*	7.48	300	2244.00
	73.60		5029.50

*53-20 mu

AFA Fineness Number = $\frac{5029.50}{73.60} = 68.36$

TABLE III — FINENESS WITH SILT AND CLAY

Sieve	% Retained	Multiplier	Product
6	.10	3	.30
12	1.20	5	6.00
20	5.60	10	56.00
30	6.28	20	125.60
40	16.72	30	501.60
50	17.76	40	701.40
70	9.68	50	484.00
100	4.30	70	301.00
140	2.00	100	200.00
200	1.44	140	201.60
270	1.04	200	208.00
Pan	33.88	300	10164.00
	100.00		12949.50

AFA Fineness Number = $\frac{12949.50}{100.00} = 129.50$

TABLE IV—DATA ON STEEL FOUNDRY SANDS

Sample	A	B
Q_1	700	293
M	475	242
Q_3	338	210
So	1.44	1.18
Sk	1.05	1.05
Log Sk	0.021	0.021
Gravel	8	0
Sand	92	100
Silt	0	0
Clay	0	0
Colloid	0	0

Sample	C	D
Q_1	217	131
M	186	109
Q_3	152	90
So	1.195	1.206
Sk	0.953	0.993
Log Sk	—0.021	—0.007
Gravel	0	0
Sand	100	98
Silt	0	2
Clay	0	0
Colloid	0	0

on a more accurate and therefore a scientific basis.

General Considerations. The present AFA method of determining sand fineness is based on the determination of clay by settling and decantation to remove the particles which settle at a rate of less than 1 in. per minute, and separation of the grains which remain in a nest of sieves arranged so that the coarsest sieve is at the top of the stack. The sieves must be of certain sizes and must meet rigid specifications. The fractions retained on the various sieves are then multiplied by factors as shown in Table I to obtain the *AFA fineness number*.

This test in its present form has several faults. At the fine end only one point is determined which is the 20 micron separation. This is not a measurement of size but of the percentage of the material coarser or finer than 20 microns. Material finer than this size is called *AFA clay* but it could be nearly all fine silt composed of fine silica particles and actually contain very little active clay. The directions for making this test are not entirely clear on what is to be included in the silt-clay region. Some fineness analyses are made including the clay in the computations, while others are computed on the basis of grain material only. Some include silt but not clay. The former method naturally produces a much higher fineness number. Tables I to III, inclusive, show the computation of the *AFA grain fineness* number in various ways. When the number is found it gives a general idea of the size of the sand if one is familiar with the numbers, but they have little relation with any actual dimensions, and they show very little about the character of the sand.

The extensive bibliography of methods for particle size determination, listed at end of this paper, indicates the large amount of information in this field. Some of the more pertinent articles are discussed here very briefly to furnish a background for the techniques described later.

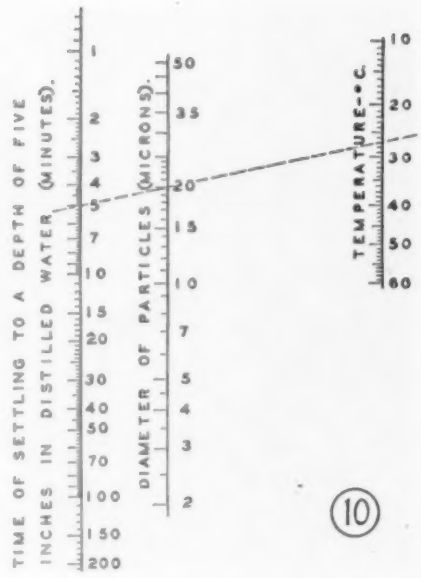


Fig. 10 — Nomographic chart (from Jackson's paper) indicating relation of temperature, time of settling, and particle size of molding sand

Krumbein[30] describes the history and progress of mechanical analysis from the decantation methods of ancient Greece to modern techniques. According to Krumbein, sieves were first used in 1704. In 1784 sedimentation was used for separation of a sediment into three grades, and in 1805 sieving and decantation were combined in a single technique. Elutriators were used in 1839. Stokes law was formulated in 1851 and (*Please turn to Page* 250)

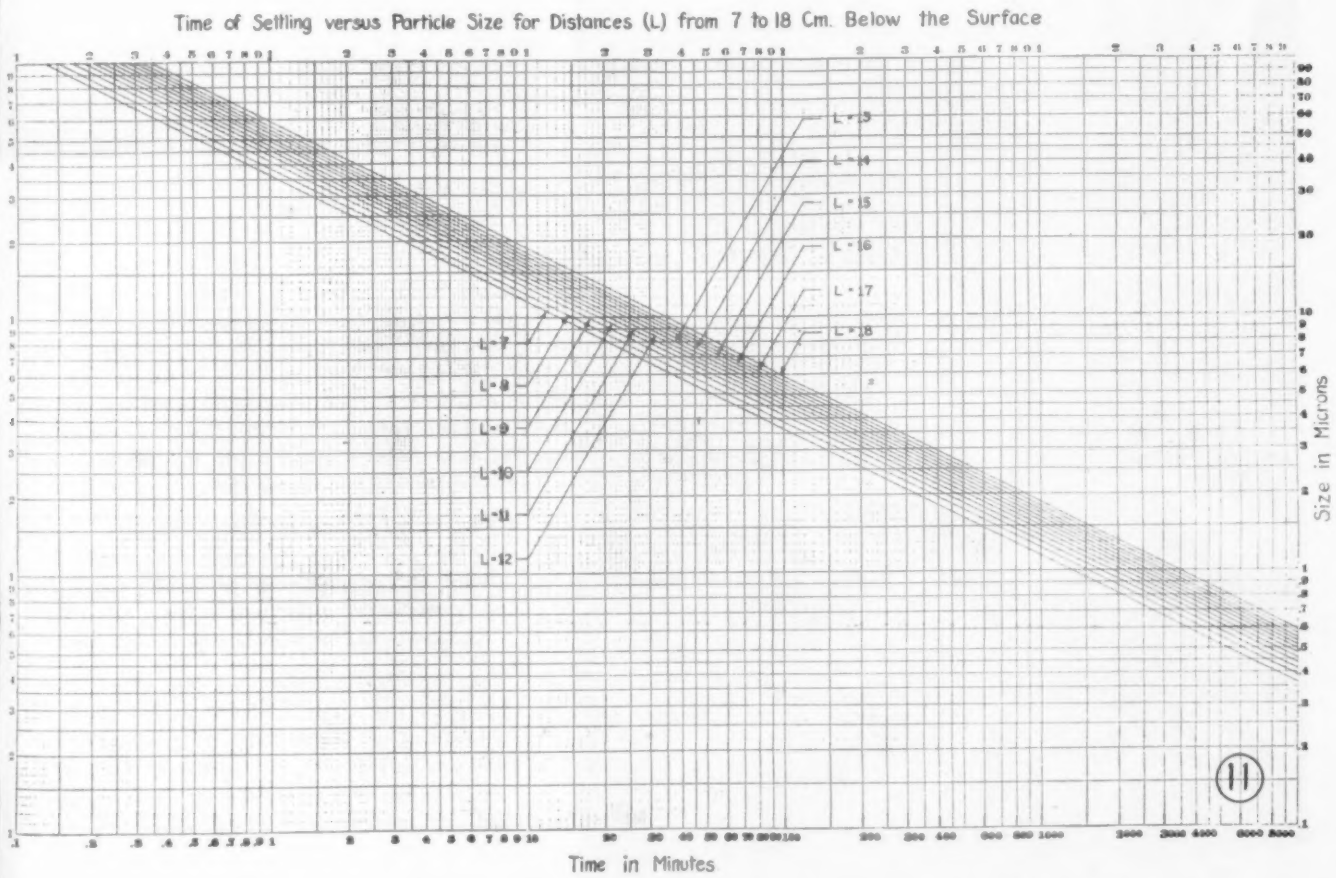
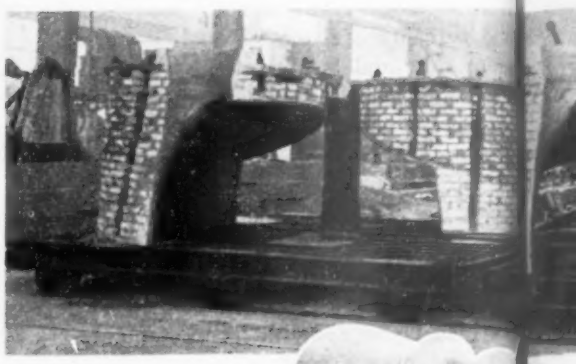


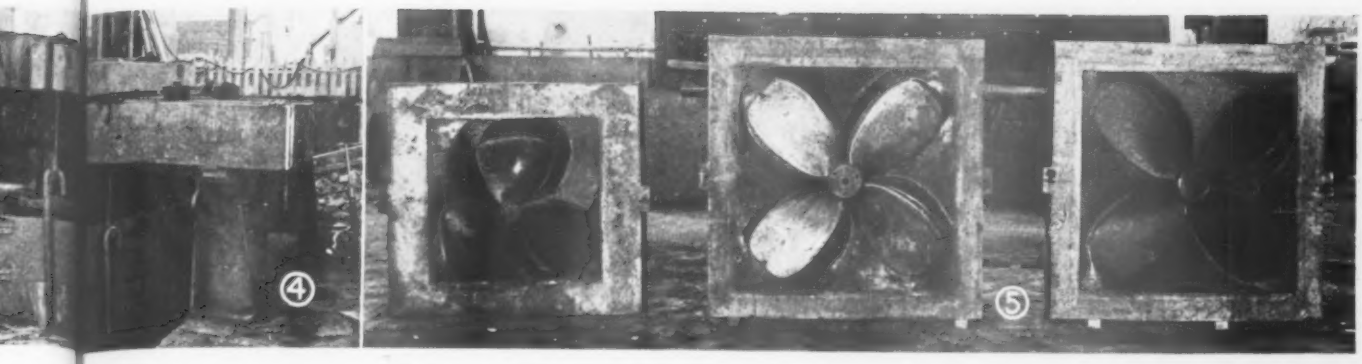
Fig. 11—Chart showing relationship between time of settling and particle size for various distances below surface



Figs. 1, 2, 3, 4 *and* 6 *illustrate several stages in the construction of a loam mold for a bronze propeller approximately* 18 *ft in diameter. Fig.* 1 *shows the drag part of a mold partly completed. The mold filled with metal and partly stripped for removal from the pit is shown in Fig.* 2. *Relative position and size of sprue and feeding riser are indicated in Fig.* 3

Binder bars shown in Fig. 4 *extending across the pit and hook bolts attached to binder bars above and a substantial foundation plate below prevent the mold from yielding when filled with the molten metal under a high head*

Fig. 6 *shows a group of individual copes loaded on oven cars. Fig.* 7—*Some center cores are straight, while others carry extensions to reduce the amount of metal in the hub of the casting. Small propeller patterns are mounted on follow boards as shown in Fig.* 5



By PAT DWYER
Engineering Editor
THE FOUNDRY

Navy Yard Makes Manganese Bronze Propellers

THROUGH the radio, pictures and the combined and sometimes frantic effort of newspaper correspondents and publishers, the great American public is fairly familiar with the Navy, what it is, how it operates and where, to some extent, the various units or groups of units are doing duty at any given period. This, of course, is as it should be, since the Navy is a piece of public property in which every citizen has an equity. The personal interest is more intimate and intense for those who have served, or are now serving in the Navy, or for the other great multitude with sons or other close relatives in the service.

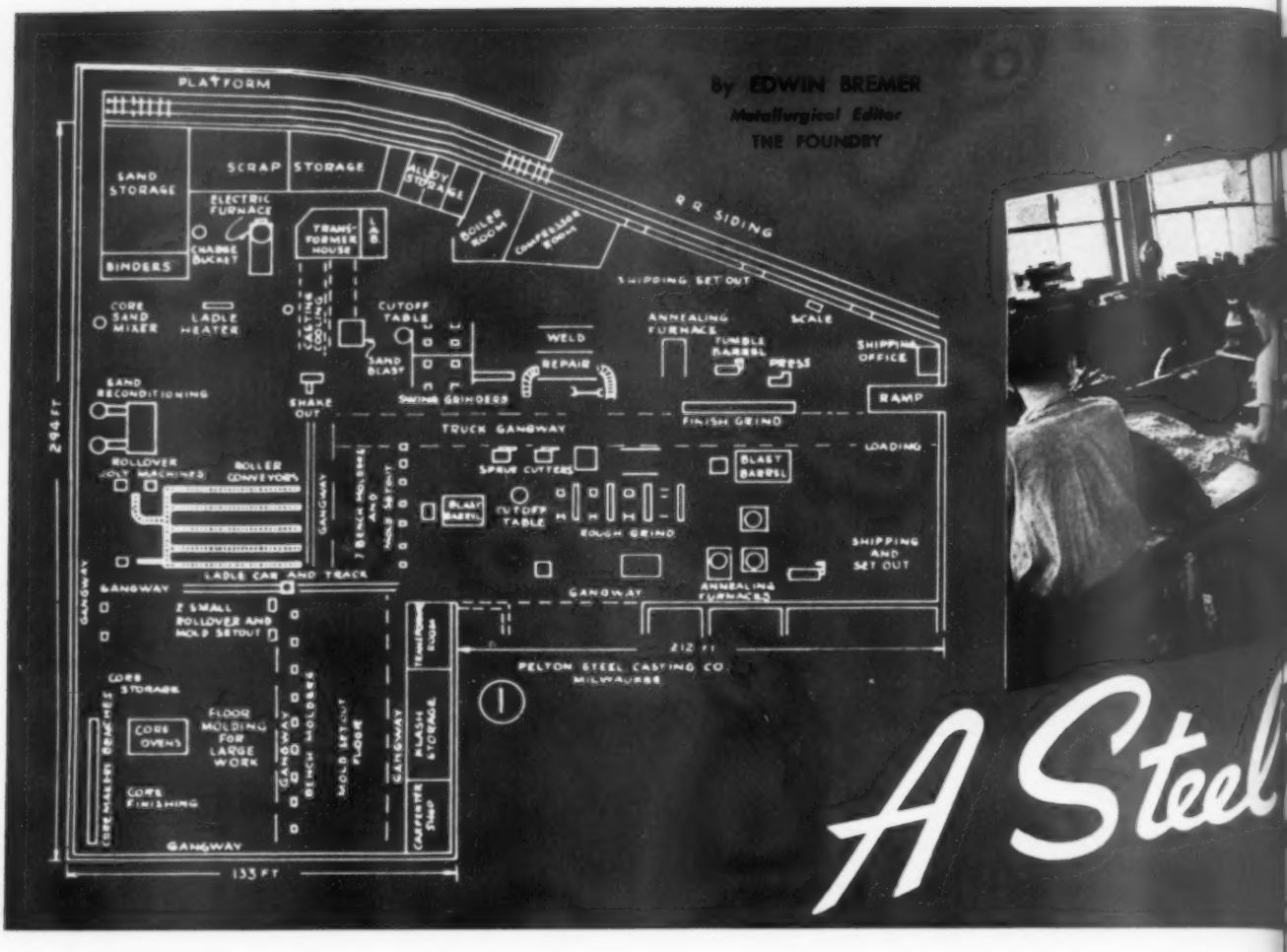
By a peculiar quirk of human nature, bland indifference or blind and complacent faith, which accepts the most stupendous modern miracles as commonplace, the general public has little or no conception of how or where the ships are built, equipped and sent out to sea, or where later they are reconditioned or repaired after long service. In a vague and hazy manner the public assumes that when the mysterious entity known as the Gov'mint decides to build a new ship or patch an old one, the Secretary of the Navy nonchalantly rubs the tip of a daintily manicured index finger over his Aladdin's lamp. The Geni, in the person of a tanned and salty bo's'n, rolls up, salutes smartly, blows three piercing blasts on his whistle—and the job is done.

Without violating any confidence it may be stated that this is not exactly true. Repairing old ships and building new ships is a long and costly process and probably furnished the foundation for the present slogan of many organizations, "The hard jobs we do right away. The impossible jobs may take a little longer."

A staggering volume of work, routine work, hard work and impossible work characterizes the operation of several great plants operated by the United States Navy on the East and West coasts. In the Philadelphia Navy Yard, the employed personnel during the past year has been over 40,000. Following a tour of the yard, even a brief reference to the many activities would fill a large volume. The present description, in two parts, is confined to the foundry which produces ferrous and (*Please turn to Page* 200)

By EDWIN BREMER
Metallurgical Editor
THE FOUNDRY

A Steel Fo



JOBBING foundries as a general rule tend to become cluttered up considerably, due to the very nature of their work involving the production of a wide range of short-run miscellaneous castings requiring numerous different sized flasks and molding procedures. Tendency after shakeout is to pile the flasks, jackets and bottom boards in locations where they will be easily accessible, but unless constant vigilance is employed those pieces of equipment become all mixed up, and before long the spot also becomes a collecting place for all kinds of discarded materials.

Such conditions are unnecessary, since the application of good housekeeping principles will remedy the situation in short order. That it can be done and maintained successfully is shown in the accompanying illustrations of various departments of the Pelton Steel Casting Co., Milwaukee. The firm operates a jobbing steel foundry in making a variety of plain and alloy steel castings, and at present is shipping about 600 tons a month. As may be observed from the accompanying sketch of the floor plan, Fig. 1, castings are produced by open-floor, bench and machine molding.

One of the numerous features of the foundry is a gangway 6 feet wide which runs along the walls for nearly their whole length. This gangway, as well as others indicated on the floor plan, is kept clean and free from sand at all times. Other features include a tramrail crane system with numerous light, electrically operated cranes to perform any lifting operation within their capacity. These are in addition to two 10-ton cranes spanning the main central bay for carrying the hot-metal transfer ladle, charging the furnace, and other heavy work. Comfortable working temperature in winter is provided by a series of individually operated overhead blast type heaters located so as to give good distribution. The plant also has an excellent locker room, which adjoins a washroom and is equipped with showers and washing facilities.

Foundry is located in a modern steel sash and concrete construction building of L-shape. The long leg extending practically north and south is approximately 345 ft long, and the short leg is about 294 ft long. All molding, melting, core-making, and shakeout operations are conducted in what might be termed the base of the L-shaped building. The L is 133 ft wide and composed of a high bay about 40 ft wide in the center with a low bay on each side. Cleaning, finishing and heat treating are performed as indicated on the floor plan in the other leg of the building. As may be observed in several of the accompanying illustrations, excellent lighting is supplied by the wide expanse of steel sash supplemented, when required, by numerous combination fluorescent and mercury lights in the low-bay areas, and mercury lights in the high-bay areas.

Brief study of the floor plan will indicate at once that the arrangement of equipment and operations is such as to provide a straight-line flow of castings to the shipping floor without backtracking. All raw materials, such as sand, steel scrap and pig, ferroalloys, refractories, etc., are unloaded under cover and kept under cover at the southwest

Fig. 1—Schematic drawing of foundry showing floor plan and location of various departments and equipment. Layout is such that materials and castings flow in a straight line without backtracking

Fig. 2—Coremakers benches are located near the windows so that good lighting conditions are provided. A gangway between the building wall and benches permits movement of men and materials without going through core department

el Foundry Can Be Kept Clean

Fig. 3—Another view of the coreroom showing the baking ovens located under a large hood which exhausts heat and fumes to the exterior. This also shows some of the larger cores made here

Fig. 4 — Heavy castings are cleaned in their own department. Note tramrail crane for handling castings

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Fig. 5—Heat treated castings are removed from the circular furnace and allowed to cool in a pit in the floor

Fig. 6—Rope holding bottom door segments together burns through in a few seconds, permitting the charge to drop into the waiting furnace

Fig. 7—Furnace is tapped into a transfer ladle in a pit in front of the furnace

Fig. 8—Teapot spout transfer ladle is carried from the furnace and set in trunnions in about the center of the molding department

portion of the building. The electric furnace also is located in that section. Materials are kept in concrete bins.

Cores are made in the southeast corner of the molding bay, with the coremakers' benches located, as shown in Fig. 2, in a line along the south wall. As previously mentioned, a 6-foot gangway is located between the wall and benches. Core sand is mixed near the sand storage bins in the southwest section and transported to the coremakers in rubber-tired wheelbarrows. Cores are baked in three ovens which form one unit, but each has its own heating unit and control. Two of the ovens, as shown in Fig. 3, hold racks on which the cores are placed for baking, while the third is a drawer type for handling small cores. Core ovens are located under a hood which carries off the heat and also the fumes generated by freshly pulled racks of cores.

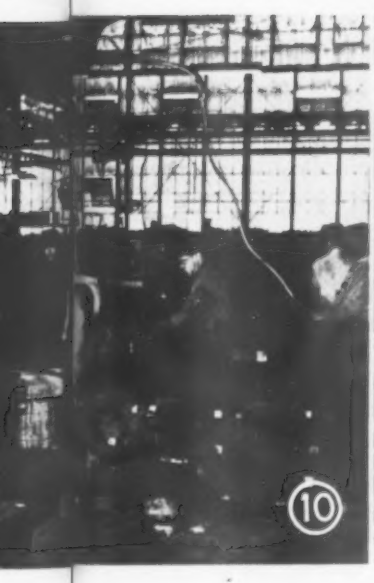
Immediately to the right of the core department and extending to a central gangway, a space about 20 x 40 ft is devoted to floor molding of large castings. On the other side of the gangway are the floors of nine bench molders. The benches are lined up along the gangway, and the molds are set out up to the gangway along the opposite wall. Machine molding is conducted approximately in the center of the molding bay, as indicated in Fig. 1, and the equipment includes two rollover-jolt machines, two small rollover, and a plain jolt molding machine. The two rollover-jolt machines and the plain jolt machine are adjacent to a series of roller conveyors on which the molds are set out for pouring.

All molding, no matter what the type of casting, is performed without the use of hooks or gaggers to hold up the sand, and is accomplished through application of a heavy layer of facing sand on the pattern. The facing sand is composed of about 800 lb of used molding sand, 12 No. 9 shovels new sand, 2 shovels bentonite, and ½ shovel corn flour. The sand is mulled for 4 minutes to develop the desired properties. Base (*Please turn to Page* 244)

Fig. 9—Filling a bull ladle from the transfer ladle. Iron pipes at sides of trunnions are slidable and are used to support the carriers of two-man shank ladles

Fig. 10—Small bull ladle suspended from tramrail crane is used for pouring medium weight castings up to its capacity

Fig. 11—Burning off gates and risers in the small castings cleaning department. In this department, as may be observed, the castings are handled in tote boxes



Institute of British Foundrymen

HOLDS ANNUAL MEETING

By VINCENT DELPORT
European Manager
THE FOUNDRY

DESPITE the fact that VE-Day had been celebrated just a little over a month previous to the date of the meeting, the forty-second conference of the Institute of British Foundrymen again was held on a reduced wartime scale on the evening of June 15 and on June 16—with no organized works visits or formal social functions. It was hoped that this would be the last occasion for the "austerity"-type meeting.

The business meeting of the institute was held June 16, with J. W. Gardom, foundry consultant, Ripley near Derby, president, in the chair. The annual report showed an increase of membership, from 2946 as of April 30, 1944, to 3368 as of April 30, 1945. Despite the accumulating effects of war conditions, the 11 British branches of the institute and the South African branch had reported increasing activities, the Technical Committee had been reorganized in order to handle a more considerable volume of work, and the Education Committee had, in addition to its regular activities, issued two important reports on the education and training of foundry apprentices.

Following the adoption of the annual report, the following awards were announced:—

The Oliver Stubbs Gold Medal to J. Roxburgh, author of many papers presented to branches and annual conferences of the institute, past president of the Sheffield branch (1935-36), now senior vice president of the East Midlands branch, and one-time member of the council, the Literary and Education Committee and of subcommittees of the Technical Council.

Dr. J. E. Hurst, past president and one of the assessors for the award of the E. J. Fox Gold Medal, announced the award to J. W. Gardom, the president. E. J. Fox himself presented a certificate in token of the medal (which cannot be struck in wartime), saying that he could not conceive of a more outstanding man in the foundry industry of the country. He mentioned that during the past six or eight years Mr. Gardom had built up, largely in a consultative capacity, a practice connected with the foundry industry of which any man might be proud. Mr. Gardom had been largely responsible for large production development of castings for war munitions. In acknowledging the honor conferred upon him, Mr. Gardom made the remark that no place of work was more interesting than the foundry, in which one could satisfy one's desires and instincts, and also one's energy and artistic taste.

The British Foundry Medal was awarded to I. Vickers, who received a check from the donor, C. Barrington Hooper, managing director, Industrial Newspapers Ltd., the medal to be given later, when available. Mr. Vickers, foundry manager, Rolls Royce Ltd., was responsible for many technical contributions of the highest degree, not only in the production of an engine known the world over, but also in regard to technical literature. In acknowledging the presentation, Mr. Vickers referred to the efforts of British foundrymen in the war, and to the adoption of gravity die castings in the manufacture of Merlin engines in Rolls Royce's Scottish works.

The Institute's Diploma was then presented to the following:

A. Dunlop, for his paper "Precision Casting by the Lost Wax Process."

E. R. Dunning, for his paper "Syphon Brick Method of Cupola Tapping."

P. T. Holligan, for his paper "Bearing Developments."

W. Montgomery and J. Doig, for their joint paper "Methods and Problems Indigenous to a General Engineering Ironfoundry."

G. W. Nicholls, for his paper "Moulding Sands and Gases in Relation to Casting Defects."

The meeting then proceeded to the election of the institute's officers for the ensuing year. J. W. Gardom was elected president for the second consecutive year. In proposing the re-election, D. H. Wood, senior vice president, said that the lamentable death of Dr. T. Swinden, the junior vice president, during the past year had caused the executive committee to recommend that Mr. Gardom be asked to continue in office for a further year. Mr. Gardom's election was unanimous. In returning thanks for his election, Mr. Gardom discussed the problem of the returning ex-service man and said that a man who could adapt himself to Dunkirk, El Alamein, Burma and the beaches of Normandy did not constitute so difficult a problem as some people appeared to think. He had been well trained to work with other men, and had been subjected to a discipline which he had accepted willingly. If managements would realize that, they would not have quite so much difficulty with the working man as they expected.

D. H. Wood, managing director, Constructional Engineering Co. Ltd., Birmingham, was re-elected senior vice president; and P. H. Wilson, deputy managing director, Stanton Ironworks Co., Ltd., was re-elected junior vice president.

T. Makemson was re-appointed secretary of the institute, and John Bolton acting secretary.

The following members were elected on the council: L. W. Bolton, C. Barrington Hooper, E. Longden, P. A. Russell, J. Vickers.

On the proposal of the president it was agreed that messages of greetings be sent to the American Foundrymen's Association, and such foundrymen's associations in allied European countries as it was possible to communicate with. The president also welcomed Prof. T. Turner, who was present at the meeting and who in his acknowledgment mentioned that it was 60 years ago that he had read his paper on silicon before the Chemical Society.

The next feature of the meeting was the presentation of the Edward Williams Memorial Lecture, which was delivered by its author. Col. (*Please turn to Page* 174)

Mechanizing THE SMALL JOBBING FOUNDRY

By W. S. THOMAS
Foundry Engineer

IF THE war has done nothing else for the gray iron industry, at least it has brought recognition of the importance of the industry to the nation and to the war effort. This recognition is long overdue. The cast iron industry has played a very vital part in the progress of the nation from the very beginning.

Army, Navy and government officials, called on to visit many plants producing various types of castings, have been amazed at the amount and type of work turned out in some instances with antiquated plants and equipment that exist in so many foundries today.

Importance of up-to-date buildings and the latest mechanized and labor saving equipment is greater today than at any other time. The industry now is before the critical eyes of the public in general. Its success in the postwar period depends on management realizing the necessity of modernization, not only from the standpoint of quality and quantity production, but also from the standpoint of employe consideration. The ability of the industry to attract young men also depends on its being in a position to offer attractive working conditions.

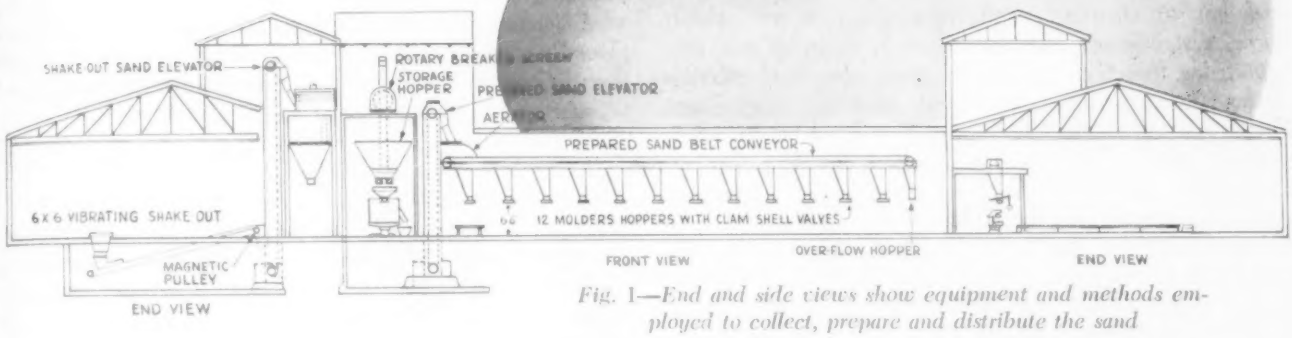


Fig. 1—End and side views show equipment and methods employed to collect, prepare and distribute the sand

Based on experience gained from visits and talks with managers and owners of nearly two dozen foundries and various equipment manufacturers, the writer has designed a postwar ferrous and nonferrous foundry for the production of high strength quality castings. With nearly 30 years experience in operation of foundries, the writer has accumulated certain ideas on how an up-to-date production foundry should be built and equipped, combining both profit and employe considerations. For a long time he has realized that large production tonnage is not absolutely necessary for a modern mechanized foundry. All the latest building and equipment improvements are as well suited to a small foundry as they are to the so-called high production automatic foundry. In a typical instance a foundry operates a completely equipped continuous pour installation for 16½ tons of iron per day, at the rate of 3½ tons per hour for 5 hours, starting at 9:30 a. m., and finishing at 3 p. m., with half hour for lunch.

In planning the layout shown in the accompanying illustrations, it was decided that a unit for handling 20 tons per day could be operated economically and profitably. While this would not be sufficient tonnage to operate as a continuous pour unit, the shop is laid out so that, if necessary, much larger tonnages could be handled on a continuous pour basis without any elaborate equipment addition or any radical change in operation.

The unit should be flexible to produce aluminum, brass or bronze and iron on the same unit, and to vary the daily tonnage to any of the three metals at a moment's notice. The daily requirements would be from 3 to 4 tons of bronze castings per day, ½ to 1 ton of aluminum, and from 12 to 15 tons of high test gray iron castings. Bronze and aluminum castings would be poured continuously from 8 a. m. until 2 p. m., after which there would be a general clean-up and the line prepared for the pouring of the iron castings. Molders and machines would continue to operate for the full 8 hours on nonferrous work. All molds made after 2 p. m. would be stored on the conveyor lines until the next day.

Mechanical equipment includes ten lines of double 6-in. roller conveyor spaced on 4-ft, 6-in. centers and 35 ft long; also four lines of 24-in. roller conveyor to handle flasks up to 40 x 60 in. Six-foot long straddle boards are used as mold carriers for squeezer machine molds. At right angles and located at the end of the 6-in. conveyor lines away from the molding machines there is a 30-in. wide double roller conveyor line 110 ft long. In this line and connecting with each set of two 6-in. conveyor lines there are right angle roller transfers extending through both sections of the 30-in. conveyor, operated by lever and eccentric cam.

A roller top turntable transfer car is located at the discharge end of the four 24-in. roller conveyor lines for transferring the large molds to the 30-in. conveyor going to the shakeout. This car is equipped with large diameter single flange roller bearing wheels operating on 16-lb tee rails. A grating with 1 x 1½-in. openings is welded be-

tween rollers. Movable sections of the same material and size are placed between each set of conveyors to form a walkway for pouring. The pouring section is 10 ft from discharge end of the roller conveyor. A fixed steel ramp leading up to the pouring platform is at the side of the last roller conveyor section. Portable steps are used for the return of empty ladles to the cupola. Full ladles are brought in over the fixed ramp, thus eliminating a hazard in transporting molten metal. An eight-man crew on gray iron includes four pourers, and four shifters. Shifters change slip jackets and weights and keep molds moving for pouring and to the shakeout station.

Conveyor lines will have storage space for poured molds as follows: 24 flasks 12 x 24 in., 32 flasks 12 x 18 in., 30 flasks 12 x 14 in. Unpoured storage per floor: 111 flasks 12 x 24 in., 148 molds 12 x 18 in., 185 molds 12 x 14 in.

The iron pouring gang will report for work at 2 p. m., and will act as night crew to put all castings over the shakeout to cleaning room, return boards to molding floors, sort castings and do a general clean-up job, preparing the foundry for the next day's operation. Molders do no pouring or other labor work. Melting, pouring and labor crew for nonferrous report at 6 a. m., to be ready to pour at 8 a. m. Their day is complete at 2:30 p. m.

Monorail system for handling iron, bronze and aluminum with pouring device for 250- pound ladles is shown in the layout. Pick-up tongs are used on crucibles for the other metals. Monorail is connected with each pouring section to be flexible and allow for the delivery of metal to all sections of the conveyor lines. Monorail also is run over to the shakeout to gangway in front of the molding machines for the return of the straddle and bottom boards to the molders. A special type sling carrier handles a number of boards at one time.

A 42 x 72-in. shakeout with dust collector hood is at the end of the 30-in. double convevor line. Castings and gates are discharged onto a portable sorting table where gates and sprues drop into wheel trucks. Castings are sorted into storage trucks for transporting to the cleaning machines. Sand from the shakeout is transported over a belt conveyor to a bucket type elevator. A magnetic separator at the end of the conveyor removes all stray metal from the sand. Bucket elevator delivers sand to a barrel type revolving screen at the top of the elevator. Screened sand is discharged into an 80-ton partitioned storage hopper. Refuse from the screen is discharged into a box truck on the floor.

A single batch measuring hopper with clam shell type discharge gate is located under the storage hopper and above a 1000-lb batch, air-cooled sand muller. Sand from the muller is discharged into a bucket elevator which, in turn, discharges into a paddle type aerator and thence onto a belt conveyor supplying sand to ten molders' hoppers of 1-ton capacity, on 8-ft centers over jolt squeeze molding machines. One hopper is located over a jolt ram, pattern draw molding machine. Another hopper supplies side floor molders handling miscellaneous jobbing work. An overflow hopper at the extreme end of the sand supply belt takes care of any sand passing the last plow. Adjustable plows at each supply point control the amount of sand passing into each hopper. Completed molds are placed on the straddle boards and move over the conveyor lines as the boards are filled. The number of molds per board is determined by the size of the flask.

Compact Core Room Is Well Equipped

The core room has two 5 x 9-ft recirculating oil fired ovens with heater units on the roof of the ovens. Lift type doors tend to reduce the amount of door clearance required. All core sand is prepared in a 300-pound batch muller with skip hoist loader. Three medium size core blowing machines and the core benches are supplied with sand by an overhead monorail with a drop bottom bucket and hand hoist. A monorail with carrier also is used to supply cores to the molders, operating on the same system used for the return of the boards from the shakeout. A 14-cu ft airless blast cleaning machine and a 9 x 9-ft sandblast room are employed for cleaning all castings.

Iron is melted in a 63-in. diameter cupola equipped with skip hoist charging system. Raw materials are stored in a series of six elevated bins close to the cupola. Bin bottoms slope to the discharge end, 30 in. above floor level. The back ends of the bins are open under the roof to allow filling from cars or trucks by a portable belt conveyor. A hinged drop-bottom scale bucket operated on a monorail runs along the end of (*Please turn to Page* 168)

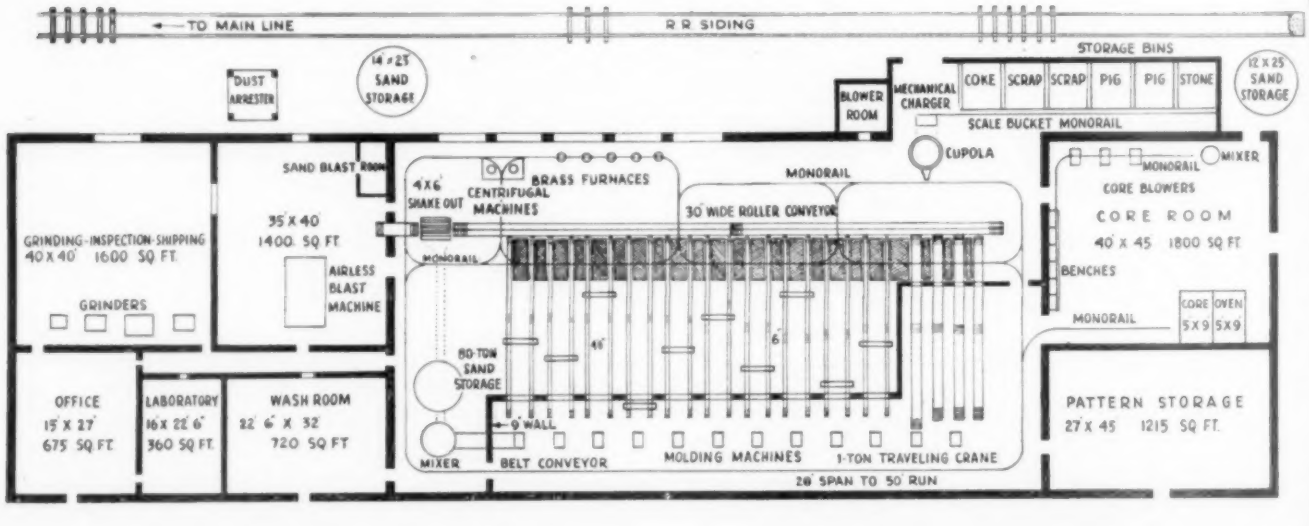


Fig. 2—Floor plan for light gray iron jobbing foundry employing 12 molders, shows relative position of different departments

REPAIR of Malleable IRON CASTINGS

This is the third of a series of suggested shop procedures covering the repair of imperfections in ferrous castings. Applying to the repair of new malleable iron castings, it was prepared at the request of Col. E. L. Cummings, Office, Chief of Ordnance-Detroit, by the Committee on Malleable Iron Casting Repairs of the SAE War Engineering Board. The procedure accompanies a Proposed Engineering Bulletin instructing prime contractors on information to be furnished in seeking approval of repair practices, and is intended as a general guide as to types and extent of repairs that will be considered.

THE purpose of the Proposed Engineering Bulletin and also of these described procedures is manifold: To facilitate legitimate production by outlining repair practices which are considered satisfactory from a quality view point, and explain them in detail; to provide an incentive for the improvement of casting quality by frank discussion of defects existing and method of repairing them; and to avoid misunderstandings as to quality levels between foundries producing castings, fabricators processing them, and armed services procuring them as finished products.

I. Extent:

In the case of minor defects, the extent of the defect can be determined by drilling, chipping, grinding, or filing out the defect. While the extent of some major defects can also be determined by drilling, chipping, grinding, or filing out the defect, in many cases the castings would be destroyed. Therefore, non-destructive methods such as x-ray inspection, gamma ray inspection, magnetic particle inspection, black light and fluorescent oil inspection and other accepted methods should be employed to determine the extent of the defect.

In the case where mechanical repairs, peening repairs, sealing repairs or rusting repairs are contemplated, non-destructive methods of determining the extent of the defect should be used. If non-destructive methods are not available or suitable, several castings should be broken through the defect, or sectioned through the defect and deep etched to determine the extent and whether it is typical of the general run of castings.

(Note: The Proposed Engineering Bulletin considers defects as minor when the depth, after preparation for repair, does not exceed one-third of the section thickness at the point or points of defect, but in no case is greater than ½-in. Maximum dimension of the prepared defect shall not exceed twice the section thickness at the point or points of defect, and in no case shall the area of the prepared defect exceed 1 sq. in. Defects beyond the foregoing are considered major defects. Mechanical repairs, peening repairs, sealing repairs and rusting repairs in all cases are considered as repairs of major defects.)

II. Preparation:

All defects, with the exception of those which are to be repaired by peening, sealing or rusting, should be properly prepared for repairing. The defect (the injurious portion thereof) must be removed either by drilling, chipping, grinding, filing, milling, blasting, etc.

When chipping or grinding is used care should be exercised to be sure that defect is removed. The preferable chipping procedure is to rough chip, then complete preparation by grinding.

Sand or grit blasting may be used for mild cleaning, but cannot be depended upon for dirty, burned-in areas.

Preparation of defects by flame gouging *should not be done.*

In cases where cracks of sufficient size to be considered as major defects are to be repaired, it is good practice to drill small holes beyond each end of the crack. The crack is then ground out from drilled hole to drilled hole. This precaution will prevent cracks from propagating under welding heat.

When doubt exists that the defect is properly removed, an approved method of inspection such as x-ray, gamma ray, magnetic particle inspection, black light, and fluorescent oil inspection, etc., should be used to insure that defect is removed.

III. Method of Repair:

A. *Arc and Gas Welding:* These methods of repair are suitable for both major and minor defects.

1. *Preheat*

a. White Iron—Usually the area surrounding the section to be welded should be slowly and uniformly preheated to 1100-1300 F before welding. Stop-welding temperatures should not drop below 1100 F, and are best checked with a contact thermocouple pyrometer or an optical pyrometer. Temperature-indicating pellets, crayons, paints, or fusible alloy can all be used to check temperatures of castings.

b. Annealed Iron—Where it is deemed advisable to preheat the annealed casting, procedure as outlined in paragraph "III A 1-a" applies. It is not necessary in many cases, however, to preheat for annealed iron welding. The nature of the defect, together with the shape and size of the casting, will determine (*Please turn to Page* 224)

QUESTIONS

Give Formula for Cope Weight

Q.—We shall appreciate information on how to estimate the minimum weight required on a cope, where the cope face projects down below the joint line of the flask. For example a cast iron cover casting 8 x 18 inches with a ½-inch rim around the edge and rounded at both ends to a radius of 3⅞ and 4¼ inches; total area 80.57 inches. The casting is molded with the open face up. Is there a formula for estimating the weight required to hold a cope in place. Is the weight of the cope flask a factor in the calculation.

A.—The formula for determining the weight required to hold a cope in place is *LWH* x 0.26 where *L* is the length of the cope face, *W* is the width, *H* is the height of the sprue, all in inches, and 0.26 is the weight of a cubic inch of gray iron. The formula is based on displacement and static pressure. Thus in the present instance the formula reduced to figures is 8 x 18 x 4 x 0.26, or 149.76 pounds. In this instance it is assumed that the height from the face of the cope to the top of the sprue is 4 inches. For any given area the height of the sprue is the determining factor. Theoretically and for instructional purposes, the weight of the cope might be taken into consideration, but in actual practice, it is usually ignored, and allowed to ride as a safety factor. On large molds the weight of the cope flask either is known or estimated, and the amount of sand is calculated in cubic feet, with an allowance of 100 pounds for each cubic foot. Incidentally we are at a loss to understand how you get a total area of 80.57 square inches for the cover.

Explains Skin Drying of Mold

Q.—We would like to have any information on skin drying molds including type of sand used, etc.

A.—Molds are skin dried for the double purpose of imparting a firm surface to the sand directly in contact with the metal, and to produce a cleaner and smoother surface on the resulting casting. The sand is dried to a depth varying from ⅛ to 1-inch, depending on the size, shape and thickness of metal section. For a mere surface skin, the sand employed ordinarily is satisfactory. The slight amount of binder in the blacking is sufficient for the purpose. Where the sand is dried to a depth of 1-inch or more, a small amount of liquid or dry core binder is added to the facing sand to increase dry strength and prevent the sand from crumbling.

Methods employed for drying the molds depend on the size, shape and number of molds to be treated in any given period; also the depth of heat penetration required. Small molds in certain brass foundries are set up on a shelf around an ordinary heating stove. Large molds are dried with charcoal or coke fires spread on steel sheets or in suitable containers over or lowered into the drags. Wood or charcoal fires may be built under the copes set up on suitable supports. Under other conditions molds are skin dried by playing the flame of a gas or oil torch over the surface. In all cases a certain degree of skill and knowledge is required to prevent burning the sand in localized areas or all over. Portable ovens which may be placed over the mold are available.

Several production foundries equip part of the conveyor lines with hoods and gas jets. The molds are sprayed with blacking before entering the hooded areas. When they emerge at the opposite end they are sufficiently dried to receive any cores. In a new type continuous gas or oil-fired oven the molds are placed on a slat conveyor on which the speed of travel may be varied and on which the molds pass through three stages of temperature, preliminary, intense, and decreasing. As they emerge at the far end, they are lifted off and placed on the assembly floor. In another method the molds are skin dried by heat developed by infrared lamps.

Addition of Silicon in Ladle

Q.—Can you tell us if there is a silicon product on the market for use as a ladle addition for increasing the silicon content of cast iron? We have been using silicon briquets in the cupola, but we want to add silicon to smaller amounts of iron rather than to a full charge—some of which does not require a silicon addition.

A.—Addition of silicon in the ladle can be accomplished through use of ground or powdered ferrosilicon which is available from a number of suppliers. Usual procedure is to allow hot metal to run into the ladle until it is about one-fourth filled, and then add the ferrosilicon at the point where the stream from the cupola strikes the surface of the metal in the ladle. That will insure rapid solution, and good distribution throughout the molten metal. In addition to ferrosilicon several proprietary graphitizing agents are available for the purpose of eliminating hard spots or edges and poor structures, improving machinability, etc. Names of suppliers of those materials may be found in the advertising pages of THE FOUNDRY.

Wants Carbon Content Raised

Q.—We are undertaking the manufacture of brake drum castings for which a 3.40 to 3.70 per cent carbon range is specified. We melt in a 54-inch cupola with a 56-inch bed which with our regular iron produces a carbon content from 3.50 to 3.60 per cent. However, when we add steel scrap to our 1200-pound charges to meet the 30,000 to 40,000 pounds per square inch tensile strength requirements, the carbon drops to 3.20 to 3.25 per cent. Can you give us any suggestions on cupola or ladle additions to bring the carbon up to the desired point?

A.—Absorption of carbon by molten steel scrap involves the temperature and period of contact with the coke. That is to say the higher the temperature, the greater the carbon pick-up, and the longer the contact of the molten metal with the coke, the higher the carbon pick-up. Assuming that your melting temperature is as high as you can get it, or that the iron is as hot as you desire it, the remaining alternative is to increase the length of time that the iron remains in contact with the coke. That

ANSWERS and

can be accomplished by increasing the height of the tuyeres above the bottom to give a deeper well or reservoir. That is filled with iron at the start of the heat, and maintained at a high level during melting—which results in the iron being in contact with the coke for a longer period than if a shallow well is maintained.

An increase of carbon can be obtained through additions of fairly coarse graphite at the spout, and probably it would require about 8 pounds per ton to obtain the desired increase. Broken furnace electrodes allowed to float on the molten metal also will increase the carbon content. Possibly the use of petroleum or pitch coke as part of the coke splits in the cupola might raise the carbon to the desired point.

Another procedure to obtain higher carbon content would be to decrease the quantity of steel scrap used, and substitute low silicon pig iron or cast iron scrap. Additions of ferrosilicon or proprietary inoculating agents to the ladle could be made to obtain the desired structure and physical properties in the resulting iron.

Gas Not Used as Cupola Fuel

Q.—We would like to build a small cupola for melting gray iron in amounts from 25 to 40 pounds. Cupola is to be fired with gasoline or any kind of bottle gas usually employed for domestic cooking and heating, or alternatively we might use fuel oil. We shall appreciate information on this subject including cost of gas or oil as compared to coke.

A.—In a cupola of any size, small or large, the metal melts at a definite height above the tuyeres, that is in the zone of maximum temperature. Solid fuel, coke, hard coal or charcoal is required to support the metal while it is melting. Therefore, you cannot use either gas or oil in this type furnace. If you are limited to the use of gas or oil as a fuel, you can melt small quantities of iron in a crucible, or in a small chamber furnace where the metal lies on the hearth and the flame plays over it. The crucible fire will require a forced draft unless you have an exceptionally high chimney. The chamber furnace requires a special type burner to secure the necessary high temperature. Without a background of practical experience and knowledge we are afraid you are not in position to build this type of burner. Our suggestion is that you get in touch with one or more of the furnace makers whose names and addresses appear in the advertising pages of THE FOUNDRY. A further suggestion, and one that probably will reduce your troubles to a minimum is to have the castings made in some regularly established foundry where necessary equipment is available.

Make Abrasive Faced Casting

Q.—We are interested in finding out how to cast abrasive material directly into one side of a cast iron disk such as used in potato peeling machines. Can you throw any light on the subject?

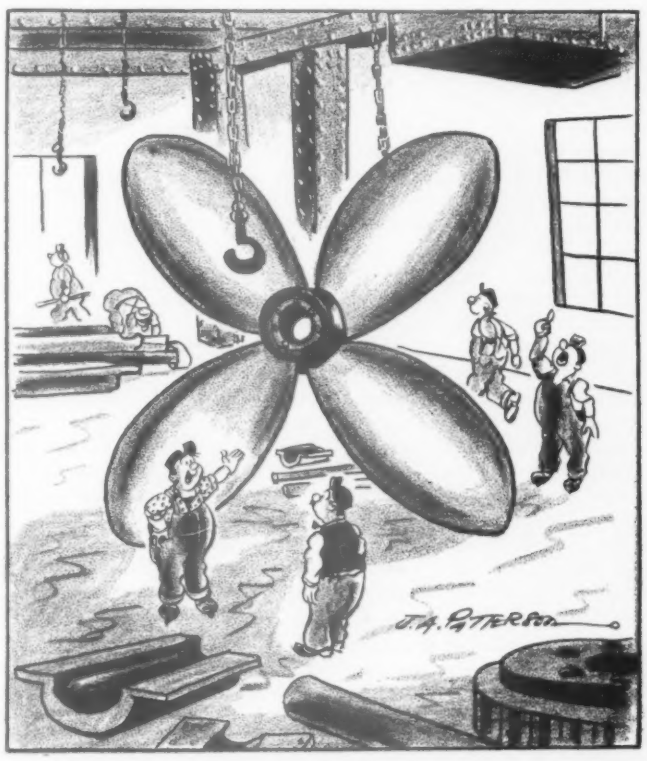
A.—Production of abrasive-faced castings requires some experience to obtain a quality job. Essentially the procedure is to coat the mold face with some material which provides an adhesive or sticky surface and then sprinkle on the desired abrasive material uniformly. Then that facing must be dried thoroughly before the iron is poured into the mold. As you undoubtedly know, there are a number of materials available which can supply the sticky medium and they include molasses water, claywash, sulphite liquor binder, bentonite with or without sodium silicate, sodium silicate solution, etc.

Smallest possible quantity of those materials should be used on the mold face to shorten the necessary drying period, but amount used must be sufficient to hold the abrasive in place. Usually spraying the adhesive over the mold face is preferable to brushing since less can be used, and applied more uniformly. Abrasive usually employed is silicon carbide, and the grit usually ranges from 30 to 36, although it may be coarser or finer. The abrasive must be applied in thin layers with the use of some adhesive between. Method is to use a screen or sieve with the same mesh opening as grit size, and the abrasive carefully distributed. Two layers probably will be sufficient.

Mold face with its coating of abrasive is skin dried to insure evaporation of moisture for a reasonable depth, and then the iron poured into the mold. For best results the iron should be hot and fluid.

GANGWAY!

By J. A. Patterson



"Man Howdy! What I wouldn't give to have that baby set up in my bedroom these hot nights!"

Matchplates Are Made By Pressure Casting

Q.—We are interested in making aluminum matchplates by the process known as pressure casting. Can you give us any information on the procedure?

A.—Method of making matchplates and patterns by the pressure process usually includes plaster molds, and since you do not mention whether you are familiar with the essential features of plaster molding, it might be advisable to give a brief synopsis. Type of plaster to be used is that known as metal casting plaster. It is mixed with fibrous talc in the ratio of 4 parts plaster to 1 part talc in the dry state until the mixture is of uniform consistency or for about 10 minutes. For calculation purposes 1 pound of dry mix will occupy about 48 cubic inches of flask space.

Dry mix is added to water (preferably warm) in the proportion of 1 pound mix to 1.7 pounds of water and stirred until it starts to cream or thicken. Then the mixture is poured into the snap flask containing the pattern or matchplate. The flask or mold is allowed to set for 15 to 30 minutes until the mixture becomes firm. Then the mold is lifted straight from the pattern to prevent any breaking of corners, etc.; the flask removed, and the mold placed in an oven to dry. Oven temperature may range from 600 degrees Fahr. to 1500 degrees Fahr. At 600 degrees the mold will require 8 to 10 hours for drying while at 1300 degrees the time will be around 2½ hours. Mold should remain in the oven after drying until the temperature drops to around 300 degrees to prevent cracking on removal. Molds should not be allowed to become cold before pouring since they tend to absorb moisture.

The so-called pressure casting phase may or may not involve use of air pressure. In the one only hydrostatic pressure developed by the use of a pouring sleeve is depended upon while in the other around 10 pounds per square inch air pressure is imposed through a cap fitting over the sleeve. The pouring sleeve may be made entirely of plaster, or of a piece of pipe lined with plaster, and its length may vary from 12 to 24 inches. One end of the sleeve is designed to make a good tight fit with the sprue hole in the mold to prevent leakage of metal in the joint. Bottom of the sleeve usually is capped with a thin asbestos disk until the sleeve is nearly filled with molten metal which usually punctures it about that time. If that does not occur the disk must be ruptured with a rod or stick without stopping the pouring of metal—unless the sleeve capacity is sufficient to hold all the metal to pour the matchplate.

A few points not mentioned previously include the use of an oil-wax type of parting compound on the pattern before the liquid plaster mix is poured over it. Proprietary partings may be purchased or you can try mixtures of stearic acid and kerosene; petroleum jelly, lard oil or light lubricating oil with or without kerosene to thin them out to the desired consistency. Since plaster molds are poor conductors of heat, gates can be smaller than those used for sand molding. Metal should run into the mold slowly so a good choke is placed between sprue and runner, and generally with aluminum, a choke ½-inch in diameter with a 1¼-inch diameter sprue will serve. Choke should form a hot spot for good feeding, and consequently, the length should be short, say ½-inch, opening then into the full diameter of the sprue.

Inquires on Asbestos as Core Material

Q.—We are located in Australia and recently considerable discussion has arisen on use of asbestos as a core material. We can find no reference in books or literature to that application. The idea generally is that asbestos is used like sand or other core material, and has the advantage of being quickly withdrawn during fettling. We have not seen it used, but have been informed that it is in fairly general use in the United States.

A.—So far as we know asbestos is not being used in this country as a core material, and while it is resistant to heat, we doubt that it could be used satisfactorily. We wonder whether the information you received was on the use of fibrous talc in the production of plaster molds and cores, or perhaps to the use of asbestos paper sleeves in the pouring sprues of magnesium castings in particular to insulate the molten metal at that point from the chilling action of moist sand.

A mixture of asbestos and portland cement is formed into boards of various thickness under pressure, and those are used as core plates. Also they are used in building construction, especially when pressed in corrugated form similar to steel sheet. Asbestos shingles are made from the same composition.

Economics Determines Molding Method

Q.—If you had a quantity of 1½-inch diameter bronze bars 12 inches long to be made of the 80-10-10 alloy, would it be better to use a permanent mold or cast them in sand? If so what would be the best method of producing them?

A.—Decision on whether to use a permanent mold or to employ sand casting is a question mainly of economics although the problem of surface smoothness may enter in. In other words if the final cost of the castings is sufficiently less by one method than by the other, the one with the lowest cost is selected. You do not mention how many castings are to be produced, and that will be important since the higher cost of permanent molds limits their use to long production runs which permit reasonable amortization of mold cost. If it is decided to use a permanent mold for producing the bushings, we believe that best results will be secured where the castings are poured vertically.

As far as sand casting methods are concerned, the castings may be poured vertically or horizontally—the molds in both cases being made horizontally. Arrangement of the pattern could be four on a plate for say a 16 x 16-inch flask which one man could handle easily. The four patterns are connected at the top by a runner. In the case of pouring vertically special flasks with an opening along one side which later becomes the top, to form a pouring basin would be required. Hence, it might be advisable to pour horizontally to eliminate cutting the openings in the flasks. In horizontaal pouring the runner should be of sufficient size to insure a good feed of metal to the castings, employing a smaller connection or gate into the casting which should be as short as possible to form a hot spot at that point. To obtain the thinnest body of sand at that point a core could be used which would eliminate the possibility of the green sand breaking or washing.

The runner is connected to a sprue at the center which extends into the drag for an inch or so. If a reasonably deep cope is used say 4 or 5 inches the sprue probably would supply sufficient pressure. However, a shallower cope could be used, and the sprue extended by a box or bushing to any desired height. Additional pressure can be secured by raising the sprue end of the mold say a couple of inches so that pouring is downhill.

Reduce Slag Viscosity With Fluorspar

Q.—Can you supply us with any information on the use of fluorspar in melting cast iron?

A.—Essentially fluorspar is used as a fluidizer or diluent for slag formed in the cupola during melting. Base of the slag is limestone which is added usually on top of each coke split or charge including the bed coke—in the amount of 2 to 3 per cent of the weight of the iron charge. While limestone is used without any other addition in many foundries, it sometimes happens that the slag tends to become viscous (sticky or gummy in foundry parlance), and does not flow easily from the slaghole. To remedy that situation fluorspar is added to provide fluidity. However, fluorspar is quite active chemically and will combine with the firebrick lining of the cupola if too much is employed. Hence, the amount of fluorspar added is under 1 per cent of the iron charge weight.

Function of the fluorspar is to decrease the viscosity of the slag without lowering its basicity as pointed out by Briggs on page 303, *Transactions*, American Foundrymen's Association, Vol. 47, 1939, who stated in a discussion of steel melting in the basic electric furnace:

"The primary function of fluorspar is to lower the viscosity of the basic slag.

(*Concluded on page* 116)

ON THE MARCH
to aid Foundrymen...

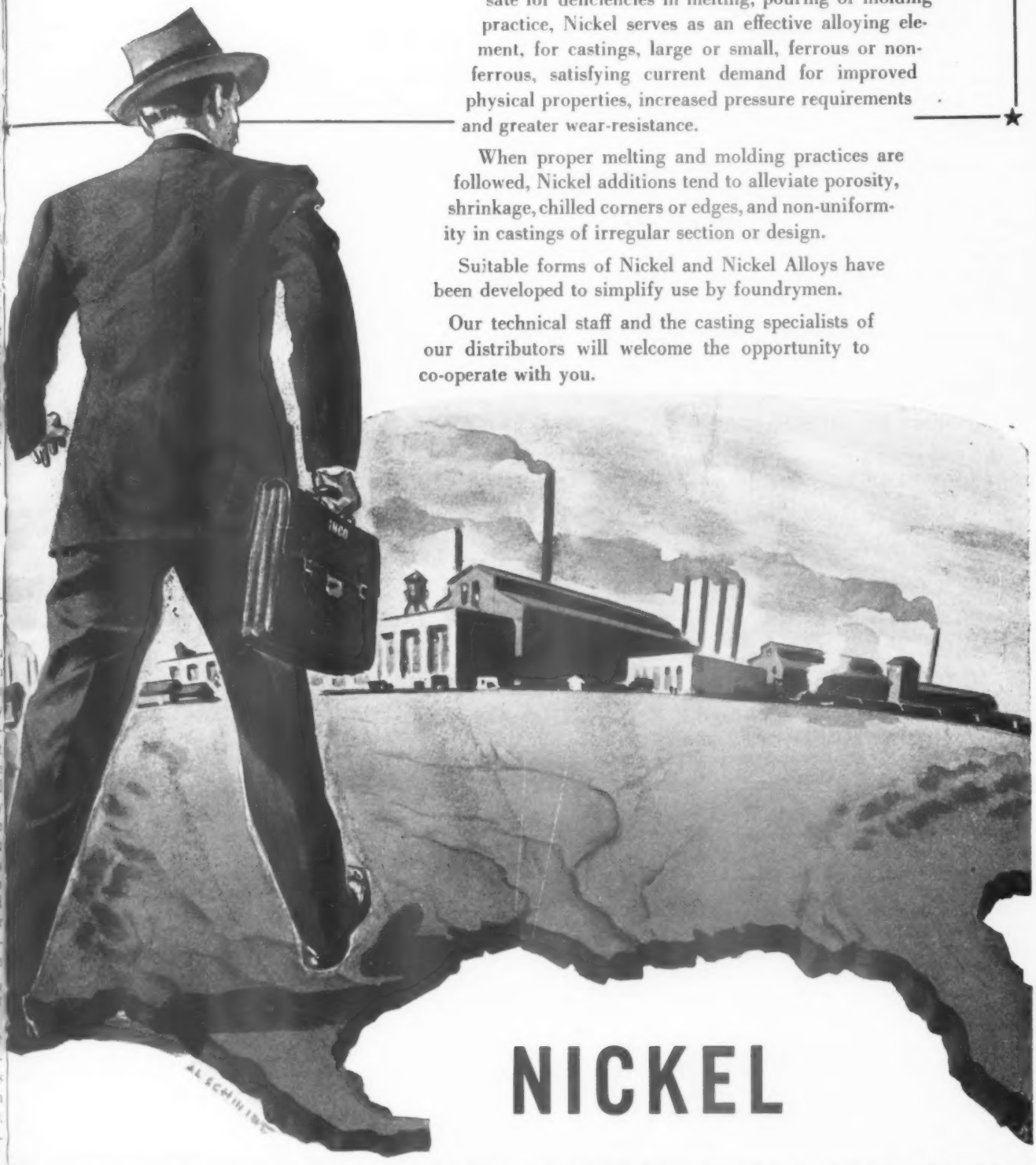
NICKEL FIELD REPRESENTATIVES are always "on the go." By reason of training and experience they are equipped to offer timely assistance on foundry problems.

While not a "cure-all" in that it will not compensate for deficiencies in melting, pouring or molding practice, Nickel serves as an effective alloying element, for castings, large or small, ferrous or non-ferrous, satisfying current demand for improved physical properties, increased pressure requirements and greater wear-resistance.

When proper melting and molding practices are followed, Nickel additions tend to alleviate porosity, shrinkage, chilled corners or edges, and non-uniformity in castings of irregular section or design.

Suitable forms of Nickel and Nickel Alloys have been developed to simplify use by foundrymen.

Our technical staff and the casting specialists of our distributors will welcome the opportunity to co-operate with you.



NICKEL

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK, N. Y.

(*Concluded from page* 114)

It also aids in the removal of sulphur and phosphorus from the steel, indirectly, by decreasing the slag viscosity, and directly, by forming compounds containing phosphorus and sulphur which may enter the slag or escape by volatilization. Fluorspar makes it possible for a slag to have a high lime content without being excessively viscous, a fluid slag being more reactive than a viscous one, and it does this without changing the basicity of the slag."

While melting conditions and reactions in the cupola and basic furnace hardly are comparable, we believe that they have certain similarities. We do know from practical experience that fluorspar will fluidize cupola slag, and some are inclined to the belief that fluorspar additions increase sulphur removal.

In conclusion it might be pointed out that fused soda ash acts in a similar capacity as fluorspar, functioning as a slag fluidizer and desulphurizing agent. Consequently, in many instances it is being added to the fluxing agents in the cupola. However, for greatest efficiency as a desulphurizer, fused soda ash is used alone on the molten metal in a mixing or other suitable ladle.

Changes in Pattern May Not Be Difficult

Q.—With the installation of a jolt squeeze, rollover, pattern draw machine we shall have to change over from loose patterns to pattern boards. Our present patterns are aluminum and our original patterns are no longer in existence. Our problem is to duplicate the present patterns without getting a shrinkage. Have you any suggestion on how this can be accomplished in more economical manner than having new master patterns made and then casting a new set of patterns for cope and drag?

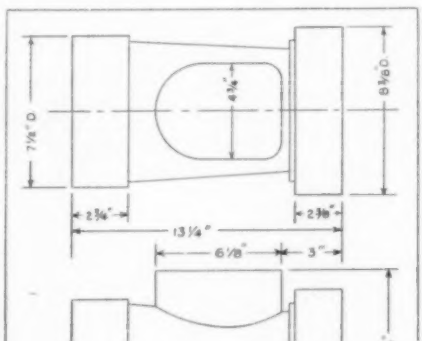
A.—A satisfactory solution to the problem depends to a considerable extent on the size and shape of the present patterns. We might offer a definite opinion if any given pattern was presented for consideration. In a broad general way it may be stated that all metals shrink to some extent while passing from the liquid to the solid state. This is one of the immutable laws of nature against which there is no appeal. However, in some instances, as with nearly all laws, it is possible to find loop hole. Our first and natural question is what is there to prevent you from mounting your present patterns on boards? Why should you want to make duplicate patterns, since presumably you will use the same flasks on the machine that you used with the loose patterns?

In many instances where the total length, height or width is not an important factor, duplicate patterns may be made from existing patterns. The slight difference in size will not affect the product. In other instances it is common practice to saw the existing patterns apart into as many sections as necessary. Place distance pieces in the saw cuts to anticipate the shrinkage, and then make a mold and a new casting to serve as a working pattern. In recent years plaster and proprietary materials have been employed extensively as pattern-making material. Mixed with water the liquid compound is poured into a sand mold where it solidifies quickly. It is claimed that the shrinkage especially on small patterns is negligible. Manufacturers' names and addresses appear in the advertising section of THE FOUNDRY.

Support Is Needed for Core in Baking

Q.—We are making some large cores in the form of a cross which are about 10 x 13 inches on the longest dimensions, and 6 inches in diameter on the arms as indicated on the sketch. We are having trouble in that the cores are sinking and becoming distorted. We use a 2-part corebox, and bake the core on end. Can you suggest the proper sand mix?

A.—The core sand mix can vary to a considerable extent without affecting the utility of the core, but the mixture is only a minor factor if any, in preventing distortion of a high core with two projecting members on opposite sides. If the extent of the order warranted the expense, the proper method of making the cores is to roll them horizontally into dryer shells before they are placed in the oven. On short order a temporary wood frame filled with molding sand will serve the purpose. After the core



Core needs support whether dried vertically or horizontally

is rammed, the drag half of the corebox is removed. The wood frame is set in place and filled with molding sand. The plate is clamped in place and the entire assembly is rolled over. The upper part of the corebox is removed. The wood frame also is removed and the supported core is placed in the oven.

An alternative method in which no dryer is required and by which the cor can be dried on end as at present is t place an upright arbor in the center o the core to carry the weight. This arbo could be a section of 3-inch steel pip about ¼-inch less than the length of th corebox. Vent holes ¼-inch in diame ter are punched or drilled about 1 inch apart all over the pipe. Assuming that the corebox is open at both ends and als at the two side windows, four 4 inch nails are inserted in each window, one at each corner. If the windows are not open, four holes can be drilled for the insertion of the nails. A typical core sand mixture might contain 80 parts sharp sand, 20 parts new molding sand, 1 part core oil, 2 parts cereal binder. The moisture content of the sand should not exceed 6 to 7 per cent. Wet sand has a tendency to sag.

Monel Metal Practice Somewhat Unusual

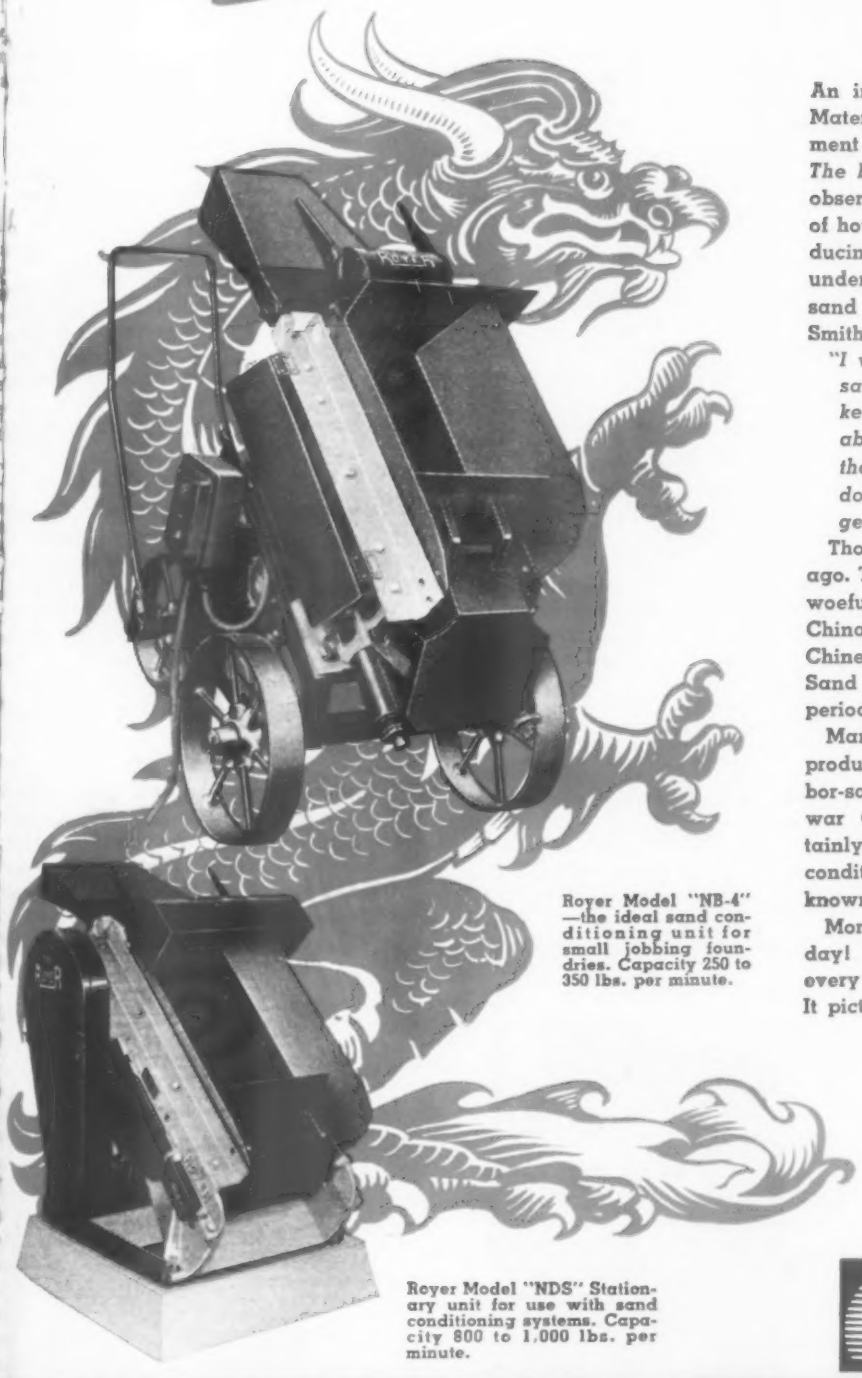
Q.—We are melting Monel metal in a rotating, electric arc furnace, and our practice differs considerably from that usually employed. For example, we have tried magnesium as a deoxidizer but it fails to function as the metal "comes up," and we flux with manganese boride to get good castings. Also we bring the metal composed of half ingot and half returns up to about 2850 F, and sufficient ferromanganese and ferrosilicon to bring it to specification, pour into a ladle and allow it to cool to about 2550 F, and then pour. We have tried bringing the metal to 3000 F and pouring at 2800F. without success, even though we used skin dried molds. Can you make any suggestions as to why our practice has to differ so much from that usually employed?

A.—It seems rather odd that your practice for smelting and pouring Monel metal differs so greatly from that generally employed, and more particularly that you can pour at such low temperature compared to ordinary practice, since the solidification range is given as 2400 to 2500 F. Possibly your pyrometer may not be registering properly and your temperatures actually are higher than indicated. However, that would only account for part of the story.

From your description of the metal "coming up" when magnesium is used as a degasifier, we are inclined to believe that your melting procedure leaves the metal full of gas. As a start to investigate that possibility, we would try melting a heat of all ingot material to see whether the scrap has any bearing on the condition. If the same gassy metal is found with all ingot then you might try injection of air into the furnace to change the atmosphere. Try leaving the charging door open so air is admitted, and observe the results. If that helps, but is not sufficient, then run a small compressed air line through the furnace wall near one of the electrodes to supply additional air. That procedure has been employed to eliminate gassiness in bronze melting.

ROYERS

AND CHINA'S WAR EFFORT!



Royer Model "NB-4" —the ideal sand conditioning unit for small jobbing foundries. Capacity 250 to 350 lbs. per minute.

Royer Model "NDS" Stationary unit for use with sand conditioning systems. Capacity 800 to 1,000 lbs. per minute.

An interesting article, "China Needs Raw Materials," by E. K. Smith of the U.S. Department of State, appeared in the May issue of *The Foundry*. The writer, from his personal observations, presents a vivid word picture of how a brave and patient people are producing castings for their bulky war machine under the most trying conditions. Regarding sand preparation in a Chinese foundry, Mr. Smith wrote:

> *"I watched a gang of men shovel all the sand from a fair sized foundry into baskets, carry these by means of the invariable bamboo sticks to another room, sift the sand through bamboo sieves, wet it down, run it through two old Royers, and get it back in incredibly short time."*

Those Royers were shipped many years ago. That they are still operating despite the woeful lack of maintenance facilities in China is not altogether surprising in view of Chinese ingenuity, and the fact that Royer Sand Conditioners are built to serve for long periods with a minimum of replacements.

Many domestic foundries during the war production era installed Royers for their labor-saving qualities alone, but even in prewar China, where labor-saving was certainly not a factor, correct "six point" sand conditioning provided only by the Royer was known and used.

More than 6,800 Royers are in service today! Models and sizes are available for every type of foundry. Send for Catalog 744. It pictures and describes all models.

ROYER

FOREMOST IN SAND CONDITIONING EQUIPMENT

ROYER FOUNDRY & MACHINE CO.
KINGSTON, PENNSYLVANIA

MEN of Industry

A. C. DENISON

A. C. DENISON, recently elected president of the Northeastern Ohio Chapter of the AFA, is president of Fulton Foundry & Machine Co., Cleveland. A graduate of Case School of Applied Science, Mr. Denison joined the Ferro Machine & Foundry Co., Cleveland, in 1910. Later he became associated with Fulton Foundry and remained there 6 years in various capacities involving mechanical operations and estimating. In 1921 he became manager of Euclid Foundry Co., Euclid, O., a position which he held until his resignation in 1928 to become president of the Fulton organization. Mr. Denison served as president of the Gray Iron Founders Society for two terms of office, from October 1941 to 1943.

♦ ♦ ♦

WILLIAM R. MANSKE

William R. Manske has been appointed works manager of the Denver plant, Amsco Division of the American Brake Shoe Co. Mr. Manske, who has been acting works manager at Denver since June, 1944, has been associated with the company since 1936, when he organized the Amsco apprentice training course, later becoming superintendent of the St. Louis plant. He is a graduate of Armour Institute of Technology, Chicago.

♦ ♦ ♦

William C. Snyder Jr. has been named president and general manager, Continental Foundry & Machine Co., succeeding **G. N. Herman,** who asked to be relieved of the presidency in order to move to California, where he will serve as general sales representative for the entire West coast area. Mr. Snyder recently resigned as a vice president and director, Blaw-Knox Co., Pittsburgh, and as president and general manager of the Lewis Foundry & Machine Division of that organization. Headquarters of Continental will be in the Grant building, Pittsburgh.

♦ ♦ ♦

J. C. Lucas has been appointed to establish a new management engineering department of the Mechanite Metal Corp., New Rochelle, N. Y. Mr. Lucas was formerly assistant to the general superintendent, Bucyrus-Erie Co., Erie, Pa.

♦ ♦ ♦

Carl Fornwalt has been appointed general superintendent of the steel foundry, Atlantic Foundry Co., Akron, O. Mr. Fornwalt was formerly in charge of both the open hearth and electric steel foundry production of steel castings, Lorain Division, Carnegie-Illinois Steel Corp., Johnstown, Pa.

♦ ♦ ♦

George P. Messenger, for the past 16 years chief metallurgist, Kensington Steel Co., Chicago, recently became associated with Rushlight Steel Works, Portland, Oreg., in the capacity of works manager and metallurgist. Latter company produces carbon and alloy electric steel castings.

♦ ♦ ♦

Benjamin F. Courtright, who recently was appointed sales manager, Steel Division, International Harvester Co., Chicago, has been elected vice president, Wisconsin Steel Co., the sales organization. **Harry O. Bercher,** recently made assistant to the vice president of the Steel Division, also has been elected a vice president of the Wisconsin Steel Co.

♦ ♦ ♦

R. L. Brown, sales manager, William F. Jobbins Inc., Aurora, Ill., recently has been appointed sales representative in charge of its new office at 179 West Washington St., Chicago. Mr. Brown, who has been associated with the produc-

(*Continued on page* 120)

WILLIAM C. SNYDER JR.

J. C. LUCAS

CARL FORNWALT

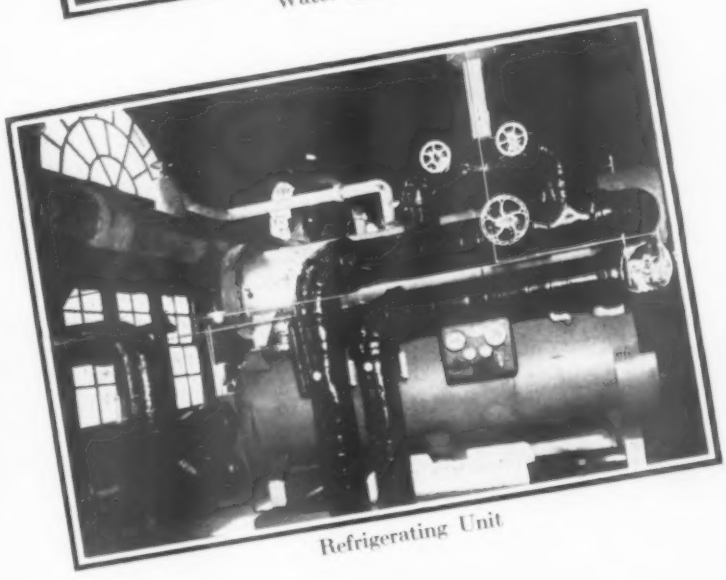
Air-Conditioning

Another Major Reason Why

WOODWARD IRON

is Uniform in Quality

Water Spray Chamber



Refrigerating Unit

WOODWARD was the first American iron maker to duplicate the most favorable atmospheric conditions for producing uniform, quality pig iron throughout the entire year by introducing air conditioning into blast furnace operations.

During periods of high humidity Woodward's air conditioning equipment removes in a single day a surprising tonnage of moisture from the blast of all three furnaces.

If uniform pig iron is important for the production of your castings, specify--*Woodward Iron.*

WOODWARD IRON COMPANY

WOODWARD, ALABAMA

Independent Since 1883

GENERAL SALES OFFICES: 1515 First National Building • Birmingham, Alabama • Phone 4-6786

(*Continued from page* 118)

tion and sale of aluminum alloys for the last 25 years, will handle sale of aluminum ingot for sand, die and permanent mold founders, as well as aluminum for the steel industry in the states of Wisconsin, Illinois, Indiana, and portions of Missouri and Iowa.

♦ ♦ ♦

E. A. Hund, until recently head designer of construction equipment, Barber-Greene Co., Aurora, Ill., has been appointed senior engineer, Lester B. Knight & Associates, Chicago, in charge of development of plant layouts for modernization and mechanization of foundry operations. Mr. Hund has been associated with the foundry equipment industry since 1926 when he joined Link-Belt Co., Chicago, as designer of foundry sand conditioning and mold handling equipment. In 1929 he became chief draftsman for National Engineering Co., Chicago, and from 1936 until joining Barber-Greene in 1938 he was assistant chief engineer for Beardsley & Piper Co., of that city.

♦ ♦ ♦

Frank E. Walling has been named acting manager of Lewis Foundry & Machine Division, Blaw-Knox Co., Groveton, Pa., succeeding W. C. Snyder Jr., who resigned recently as general manager. Mr. Walling, a native of Middletown, N. Y., where he attended public and high schools, was graduated from Lehigh University in 1934, and became associated with Lukens Steel Co., Coatesville, Pa. In 1938 he became superintendent of rolling of the Duquesne Works, Carnegie-Illinois Steel Corp. He joined Lewis Foundry in 1941 as assistant to the manager, and last year was made vice president in charge of operations.

♦ ♦ ♦

John R. Russo has been appointed general sales manager, Pacific Graphite Works, Oakland, Calif., one of the largest foundry supply and equipment companies offering a complete foundry engineering service on the West coast. Mr. Russo has been a member of the sales force of the company for almost a year and has been located on the West coast since 1937. Previous connections include General Metals Corp., Oakland, Calif., Chicago Hardware Foundry Co., North Chicago, and Carondlet Foundry Co., St. Louis, Mr. Russo entered the foundry industry with Carondlet in 1924.

♦ ♦ ♦

Eugene W. Morze has been appointed new research director of X-Ray Inc., Detroit, specialists in industrial radiography. Mr. Morze formerly was in charge of all metallurgical laboratories for Gar Wood Industries Inc., Detroit. In his new capacity he will supervise the company's complete chemical and physical laboratory services, particularly in the development of uses for light alloys.

♦ ♦ ♦

V. C. Bruce has been appointed to represent Frederic B. Stevens Inc., Detroit, through its Indiana branch, the Hoosier

V. C. BRUCE

Supply Co., Indianapolis. Mr. Bruce has had many years of practical experience in the foundry industry, his previous connections including Auto Specialties Mfg. Co., St. Joseph, Mich., Superior Steel Castings Co., Benton Harbor, Mich., and as superintendent and general manager of Miller Foundry Co., Columbus, O. He is the retiring chairman of Michiana Chapter of the AFA and has been an active member since its organization several years ago.

S. Riley Williams has been appointed director of international business, Worthington Pump & Machinery Corp., Harrison, N. J., in charge of foreign and export activities, and will supervise operation of the corporation's associated companies in foreign countries. Mr. Williams has been associated with Worthington for 25 years in its European operations, and formerly managed several of its foreign subsidiaries.

♦ ♦ ♦

Milton F. Beecher, director of research, Norton Co., Worcester, Mass., has been awarded an honorary degree of doctor of engineering by Iowa State College. Shortly after his graduation from the college in 1910, Mr. Beecher served as assistant engineer at its engineering experiment station. He received a degree of ceramic engineer in 1915 and joined Norton Co. the same year.

♦ ♦ ♦

John F. Hutson has been appointed district sales manager of the Chicago territory of National Malleable & Steel Castings Co., Cleveland, succeeding **Tom W. Aishton,** who has retired because of ill health. Mr. Hutson, who joined the company in 1919, has been sales agent at the Chicago railway sales office since 1936. **Frank E. Moffett,** sales agent since 1930, has been named assistant district sales manager for the Chicago territory. Mr. Moffett, who has been with the company since 1908, has served as draftsman, plant and safety engineer and service engineer in railway sales.

♦ ♦ ♦

Clyde Williams, director of Battelle Memorial Institute, Columbus, O., has been presented the degree of doctor of science, by Case School of Applied Science, Cleveland, in recognition of his accomplishments in research administration and in directing the activities of the War Metallurgy Committee of the National Academy of Sciences and the National Research Council.

♦ ♦ ♦

E. J. Hergenroether, recently resigned chief of the Metallurgical Branch of the Steel Division of War Production Board, Washington, has resumed his duties with the Development and Re-

(*Continued on page* 124)

E. A. HUND

FRANK E. WALLING

JOHN R. RUSSO

EUGENE W. MORZE

THE LAST *DROP* IS AS GOOD AS THE FIRST

Ask the Men Who Use It!

They Look Alike...

BUT ONE'S A GENUINE DIAMOND

It takes an expert to tell the value of a genuine diamond . . . you can't tell much from appearance. You can't tell much about Core oil either, from its looks . . . PERFORMANCE, *not price, counts!* DAYTON OIL *is doing a real job in many of America's leading foundries. The uniform, unvarying quality of this fine oil assures uniform results. Let's talk it over.*

The DAYTON OIL COMPANY

DAYTON 1, OHIO

STEEL CORE AND MOLD WASHES - BINDER AND CORE PASTE - CORE WASHES - CHILL COATINGS

Mack TRUCK CLEANING

CLEANING sand from engine and transmission castings has long been a problem at the Mack Manufacturing Company plant in New Brunswick, New Jersey—but no longer! Two 48″ x 72″ Wheelabrator Tumblasts speed the cleaning of both large and small castings, enabling the plant to maintain its schedule in the manufacture of vital automotive units for the Armed Forces.

Former procedure involved the cleaning of many of the castings by hand blasting. Wheelabrating has improved this operation considerably by doing a faster, cleaner, more economical job.

The Wheelabrators have been installed in a "high-low" combination: one machine is set below the floor line, with the front of the apron almost level with the floor; the other is set up in the usual manner. Together, they handle castings ranging in weight from 680 lbs. to 1/4 lb. Large castings are cleaned in the "low" machine and smaller castings in the "high" machine.

Unloading into tote boxes at "high" Wheelabrator Tumblast. Load consists of about 2100 lbs. of small gray iron castings.

The savings in cleaning time over the former method has been remarkable. Engine blocks are cleaned in 8 minutes; 17 transmission cases in 10 minutes; 12 cylinder heads in 18 minutes; and 2000 lb. loads of miscellaneous small castings in from 8 to 12 minutes.

In the last ten years more than 2500 Wheelabrators have been installed . . . some plants using as many as 100 and more . . . in fact, 322 concerns have from 2 to 10 machines each! Acceptance like this can mean only one thing: proved performance and customer satisfaction.

May we have the opportunity to submit complete information about the Wheelabrator as applied to your particular problem?

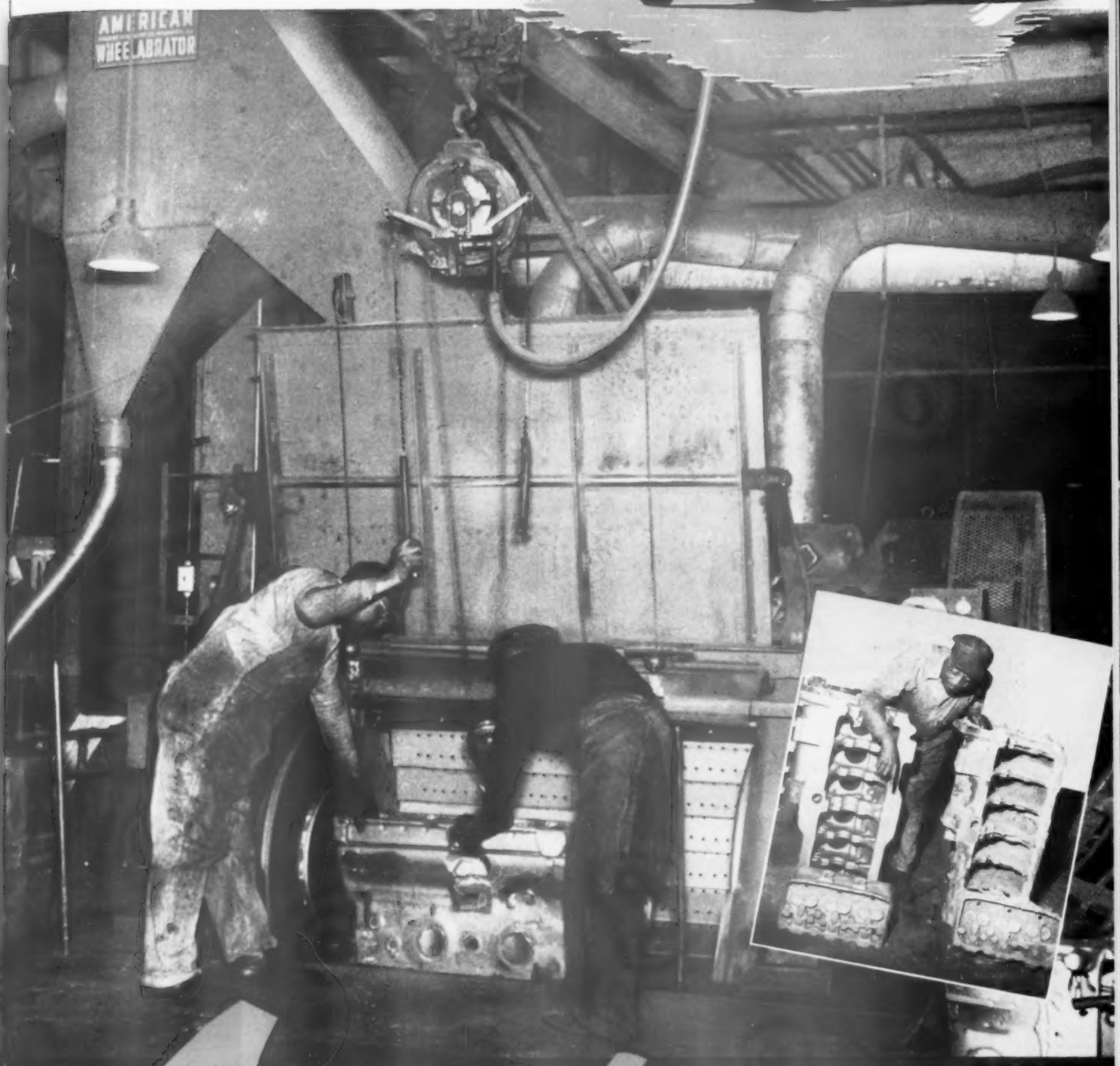
The WHEELABRATOR - What it is and what it will do

Be sure to get a copy of this new, informative booklet with its complete, concise presentation of all phases of airless blast cleaning. Included in this profusely illustrated booklet are descriptions of the Wheelabrator principle and mechanism; types and sizes of machines available; list of the many products now being Wheelabrated; types of Wheelabrated finishes; performance data; and a wealth of additional information. Ask for Booklet No. 74.

AT RIGHT: Loading a 910 engine block in the "low" Wheelabrator Tumblast with an air hoist.

WORLD'S LARGEST BUILDERS OF AIRLESS BLAST EQUIPMENT

IN CAN'T MARK TIME!



American

FOUNDRY EQUIPMENT COMPANY

505 S. BYRKIT STREET MISHAWAKA, INDIANA

WHEELABRATOR

(*Continued from page* 122)

search Division, International Nickel Co. Inc., New York, in charge of the division's automotive steel development, with headquarters in Detroit. Before going to Washington in 1941, Mr. Hergenroether had been with the Detroit office of International Nickel for 12 years. Prior to that he was assistant chief metallurgist, Cadillac Motor Car Co.

♦ ♦ ♦

Malcolm Fleming, vice president and director, Hickman, Williams & Co., Chicago, who has been in charge of the Cincinnati territory for the last 20 years, has resigned. His immediate plans are indefinite. **C. H. McNeill,** secretary and treasurer of the company, and recently elected to its board of directors, will remain in charge of the general office at Cincinnati. **Houston C. Rogers,** active in the coal department for 20 years, and a member of the Solid Fuels Advisory War Council, has been appointed district manager in charge of operations in that office. **L. C. Snyder,** well known in the foundry industry through long association with the company, has been made resident manager at Cincinnati.

♦ ♦ ♦

James H. Smith, general manager of Saginaw Malleable Division of General Motors Corp., Saginaw, Mich., has been named a member of the staff of W. C. Williams Jr., vice president and group executive in charge of accessory divisions of the parent company. **B. A. Dollens,** manager of the battery operations of the Delco-Remy Division, Anderson, Ind., succeeds Mr. Smith at Saginaw Malleable.

♦ ♦ ♦

Russell J. Wittmer has been appointed Philadelphia district sales manager for National Malleable & Steel Castings Co., Cleveland, succeeding **Edward C. Warner,** who has retired after 36 years with the company. Formerly sales agent in the southeastern territory with headquarters in Washington, Mr. Wittmer will continue his engineering and sales activities with government and foreign agencies, from the Philadelphia office. He was graduated from Case School of Applied Science, Cleveland, in 1920, and became associated with National Malleable at that time. **William M. Blackmore,** until recently connected with the development of railroad specialties in the engineering department of the general office in Cleveland, has been appointed southeastern district sales manager. He joined the company's engineering department in 1906, was later assigned to the inspection and test department and in 1913 became chief draftsman. In 1918 he was made assistant superintendent of the steel castings plant at Sharon, Pa., returning to the engineering department in 1931.

♦ ♦ ♦

Harold V. Gervais has been appointed nonferrous foundry superintendent, Wayne Foundry Co., Detroit. A graduate of the University of Detroit, his previous connections include: Chief metallurgist, McInerney Spring & Wire Co., Grand Rapids, Mich.; assistant chief metallurgist, Continental Aviation & Engineering Corp., Detroit; Ford Motor Co. laboratories. **Samuel M. Skeen** has been promoted to assistant general manager.

♦ ♦ ♦

C. C. Hermann has resigned as general manager, Claude B. Schneible Co., Detroit. After a short rest he will enter the field of consulting mechanical engineering, specializing on foundry design and dust control. Mr. Hermann has had over 25 years experience in foundry design, sand handling, mechanical handling of product, casting shakeout, casting cooling and dust collecting with Deere & Co., Moline, Ill., John Deere Tractor Co., Waterloo, Iowa, and in an advisory capacity for some of the largest plants in the country. During the last several years he co-operated with Ordnance Department engineers and was instrumental in the development of dust collecting systems for safety handling TNT dust in ordnance plants. He is a member of AFA and ASME.

♦ ♦ ♦

William H. Homeyer and **Francis J. Blake,** formerly industrial salesmen for the Carborundum Co., Niagara Falls, N. Y., have been appointed district sales managers for that company. Mr. Homeyer, with headquarters at Los Angeles, will have charge of the southern California sales area and Mr. Blake will cover northern California with headquarters in San Francisco.

♦ ♦ ♦

D. A. Newton, formerly chief engineer, Larkin Coils Inc., Atlanta, has been appointed air-conditioning engineer of the heating and air conditioning division, F. J. Evans Engineering Co., Birmingham, with headquarters in Atlanta.

♦ ♦ ♦

Harold C. Erskine has been appointed representative of industry on the Fifth Regional War Labor Board. Mr. Erskine, a graduate of Penn State University, is manager of the Cleveland works.

(*Concluded on page* 126)

Joseph C. Sullivan has been appointed Pittsburgh district editor of THE FOUNDRY and other Penton publications. He succeeds **Robert L. Hartford,** who has been transferred to the research and promotion department at the home office in Cleveland. Mr. Sullivan has been associated with Penton publications in an editorial capacity at Cleveland since 1936.

JOSEPH C. SULLIVAN

MALCOLM FLEMING

HOUSTON C. ROGERS

L. C. SNYDER

C. H. McNEILL

PHILCO

gives you the latest in Modern Battery Design!

THOUSANDS of electric industrial trucks are now getting more work done at lower cost because of the advanced research of Philco engineers in developing tougher, more powerful storage batteries. Philco has long led in providing batteries of maximum capacity, with the rugged long-life construction especially engineered for today's heavier work schedules.

Now Philco engineering leadership is demonstrated anew with the storage battery that gives 30% longer life —the great new Philco "Thirty"! For lower cost in handling materials with electric trucks, be sure to include the new Philco "Thirty" in your plans. Now available in preferred types. Complete information gladly sent on request. PHILCO CORPORATION, *Storage Battery Division*, Trenton 7, New Jersey.

For 50 years a leader in Industrial Storage Battery Development

The new Philco "Thirty" with 30% longer life is identified by its distinctive red connectors.

Man-to-Man on the Molder's Bench

By RALPH L. LEE

Editor's Note: This is the first of a series of brief, to-the-point comments having practical application to employee relations problems. They represent a further discussion of this general subject as presented by Mr. Lee in his article, "Humanics in the Foundry," which appeared in the May issue. The author is a member of the department of public relations, General Motors Corp., Detroit.

I HAVE just returned from my annual two-day shift on the molders' bench in Johnny Cochrane's foundry over in Pennsylvania. As usual, Johnny had some patterns picked out for me he knew would take me down off my high horse. There sure is a lot to this molding business.

Seeing the trouble I was in, the molders one by one—in fact, about everyone in the place including the shakeout boys—dropped by my bench to kibitz, kid or help me. I remarked to Johnny that first day at lunch that, as far as I could see, most of the old gang were sticking with the ship. He agreed that only a few had left and none of them because he wanted to.

He then told me he was glad there weren't more, for it was one hell of a job to break in new ones.

"You see, Doc," he said, "it takes quite some time before these new dudes get on to our ways around here. Take that ugly goon over there. The first day he came to work I happened to be coming down through the shop toward his bench to find him eating a sandwich. When he saw me coming he dropped the sandwich like a hot potato and started to shovel like hell.

"I walked up to him and said, 'Hey you, we don't do that around here.' 'Do what?' he asked, 'you mean eating a sandwich?' 'Hell, no,' I told him, 'eat all the sandwiches you want as long as you get your work done. But, son, I'll give you a tip if you want to get along with this gang; you have got to act just the same when the boss is here as you do when he's away'."

Then Johnny added, "That's one of the reasons, Doc, why I think the boys stick with us here."

"And that reason?" I asked.

"You know damned well what it is Doc, it's because the boys aren't afraid. They aren't afraid to make honest mistakes or of losing their jobs, nor are they afraid of me or anybody else. They know that everyone around here expects everybody else to do the job and a full day's work, and afterward they can rest when they feel they need it, eat sandwiches, talk to each other or anything else within reason. But they also know, Doc, that if they go too far somebody's going to smack them down, and nine times out of ten it won't be me or their foreman—it will be one of their own gang."

I couldn't help but think of the thousands of shop bosses I have learned to know and what a far cry it is from Johnny Cochrane's little foundry of around 65 employees to shops with twice as many in a single department. But just the same, the people in either place aren't much different so, if we want to badly enough, there is always a way of establishing the custom or style in any of our groups who work together of feeling that the job is the thing, that the gang is doing the job and everyone doing it belongs to the gang, including the boss.

(*Concluded from page* 124)

of the Aluminum Co. of America and has been with that company since 1919.

♦ ♦ ♦

Edwin D. Lucas has joined the Niagara Falls Smelting & Refining Corp., Buffalo, as representative in Ohio, Indiana, West Virginia and Kentucky, with the exception of East Chicago, Indiana Harbor, Hammond and Gary, Ind., which are covered by the company's Chicago office.

♦ ♦ ♦

Roy D. Haworth Jr., formerly metallurgist, Wyman-Gordon Co., Harvey, Ill., has been appointed chief metallurgist, Lehigh Foundries, Easton, Pa.

♦ ♦ ♦

Hermann P. Good, foundry superintendent of the Textile Machine Works, Reading, Pa., has been elected vice president of the Manufacturers' Association of Berks County, succeeding the late Ernest J. Poole Jr., Carpenter Steel Co., Reading.

♦ ♦ ♦

Howard H. Wilder, recently associated with the Detroit office of the Vanadium Corp. of America, has joined Wilson Foundry & Machine Co., Pontiac, Mich., as research metallurgist.

♦ ♦ ♦

Arnold W. Plier, recently elected secretary, D. J. Murray Mfg. Co., Wausau, Wis., has been named assistant general manager in charge of production. Mr. Plier has been associated with the company since 1930, in the cost and production departments.

♦ ♦ ♦

Charles P. Whitehead, vice president, General Steel Castings Corp., Eddystone, Pa., has been elected president of the company, succeeding **Harrison Hoblitzelle** who has been elected chairman of the board. **G. Fred Driemeyer** has been elected vice president in charge of sales; **George L. Alston** was elected vice president and continues as secretary and treasurer; **William M. Sheehan,** formerly assistant vice president, is a new vice president.

♦ ♦ ♦

George F. Hocker has resigned as chief of the Forgings and Castings Branch, Steel Division, WPB, to return to his former post with the Bethlehem Steel Co., Bethlehem, Pa. He has been succeeded by **A. Douglas Hannah,** recently chief of the Gray Iron Section. **T. H. Parke** has resigned as deputy chief of the branch to accept an assignment in Europe and has been succeeded by **C. A. Hall,** who continues as chief of the Forging Section. **J. B. Shaw,** recently deputy chief of the Gray Iron Section, succeeds Mr. Hannah as chief of that section.

Other changes in the Forging and Castings Branch are: **R. E. Valentine** has resigned as chief of the Malleable Iron Section and has been replaced by his former assistant, **F. J. Buckley. W. W. Matchneer** has resigned as chief of the Steel Castings Section and has been succeeded by **H. F. Blattner.**

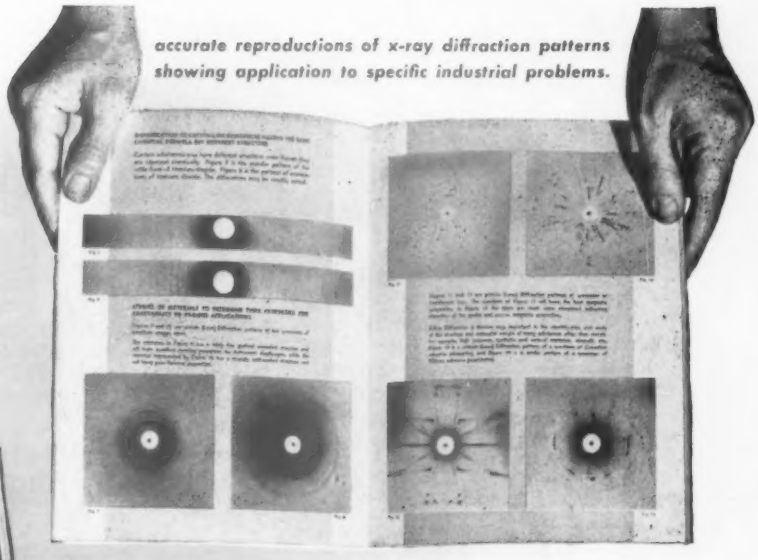
♦ ♦ ♦

L. G. Probst has joined National Engineering Co., Chicago, as foundry engineer. A native of Radford, Va., Mr. Probst worked in that city for more than 6 years as molder and laboratory supervisor at Lynchburg Foundry Co. He then entered the Polytechnical Institute, Blackburg, Va., graduating in 1940 with a degree in metallurgy. Mr. Probst spent the ensuing 4 years with Bethlehem Steel Co. as steel foundry foreman at its Bethlehem, Pa., plant. Prior to joining National Engineering he was with the FBI, Washington, for almost a year.

ASTM Holds One-Day Annual Meeting

Due to war conditions the forty-eighth annual meeting of the American Society for Testing Materials was confined to a one-session business meeting at New York on June 27. The society authorized the formal adoption of some 35 tentative standards previously published and of some 40 revisions in existing standards. At an evening session sponsored by the New York District Committee retiring President P. H. Bates gave his address on "Preparation for the Future of the ASTM", and Rear Admiral Lewis R. Combs spoke on "Preparing the Way for Victory with the Seabees".

New officers of the society whose terms became effective at the close of the annual meeting include as president, J. R. Townsend, materials engineer, Bell Telephone Laboratories Inc., New York; vice president, T. A. Boyd, head, fuel department, Research Laboratories Division, General Motors Corp., Detroit, and the following five members of the executive committee—John R. Freeman Jr., L. J. Markwardt, Carlton H. Rose, L. P. Spalding, and William A. Zinzow.



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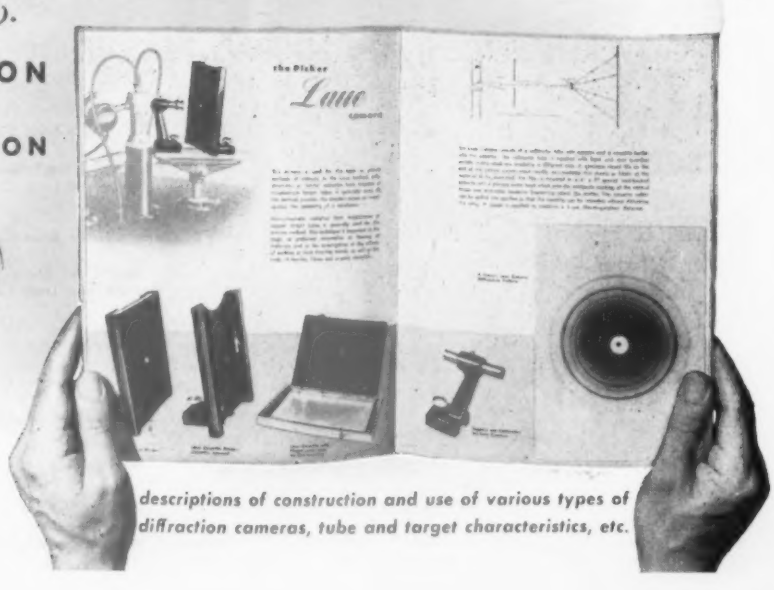

descriptions of construction and use of various types of diffraction cameras, tube and target characteristics, etc.

Ferrous Foundry War Expansion APPROACHES QUARTER BILLION

FROM Jan. 1, 1940 through June 30, 1944, the three ferrous branches of the foundry industry spent a total of $225,730,969 for foundry expansion projects, according to statistics presented by W. A. Hauck in a recent report of the Steel Division of the War Production Board on "Steel Expansion for War."

According to the report, steel foundries undertook expansion projects in the amount of $186,975,111, which was made up of $47,587,315 financed by the industry and $139,387,796 financed by the government. In the gray iron industry, the total expansion amounted to $20,361,801 of which $14,624,009 was industry financed and $5,737,792 provided by the government. Malleable foundry expansion amounted to $18,394,057, consisting of $6,638,793 financed by the industry and $11,755,264 financed by the government. Of the total expansion in all three branches, $68,850,117 was financed by the various companies undertaking the expansion, and $156,880,852 by the government.

Breaking down the industry-financed

(*Continued on page* 131)

SUMMARY OF FOUNDRY PROJECTS

	Industry Financed	Government Financed	Total
Steel Castings Companies	$47,587,315	$139,387,796	$186,975,111
Gray Iron Casting Companies	14,624,009	5,737,792	20,361,801
Malleable Iron Casting Companies	6,638,793	11,755,264	18,394,057
Total Foundry Industry	**$68,850,117**	**$156,880,852**	**$225,730,969**

GOVERNMENT FINANCED PROJECTS—INDEPENDENT GRAY IRON FOUNDRIES

Name Address	Project	Estimated Increase Net Tons		Estimated or Completed Cost Dollars
American Brake Shoe Co. St. Louis	Steel Armor Castings	4,800		564,511
Burd Piston Ring Co. Rockford, Ill.	Piston Ring Castings			125,000
Campbell, Wyant & Cannon Foundry Co. Muskegon, Mich.	Steel Castings	5,700	649,003	
	Gray Iron Castings	53,664	2,167,153	
			Company Total	2,816,156
Ferro Machine & Foundry Co. Cleveland	Gray Iron Castings	6,900		422,000
Frank Foundries Corp. Moline, Ill.	Gray Iron Castings		73,000	
Muncie, Ind.	Gray Iron Castings	4,000	93,016	
			Company Total	166,016
Gunite Foundries Corp. Rockford, Ill.	Steel Castings	2,400	53,488	
	Gray Iron Castings	5,000	144,724	
			Company Total	198,212
Marathon Foundry & Machine Co. Wausau, Wis.	Gray Iron Castings	780		11,952
Motor Casting Co. West Allis, Wis.	Gray Iron Castings			75,207
Universal Foundry Co. Oshkosh, Wis.	Gray Iron Castings	5,000		108,738
Wilson Foundry & Machine Co. Pontiac, Mich.	Gray Iron Castings	30,000		1,250,000
			Grand Total	5,737,792

GOVERNMENT FINANCED PROJECTS—INDEPENDENT MALLEABLE FOUNDRIES

Albion Malleable Iron Co. Albion, Mich.	Malleable Iron Castings	24,815		1,692,230
Buffalo Brake Beam Co. Buffalo	Electric Steel Castings	1,380		
	Malleable Iron Castings	11,212		
			Company Total	875,440
Columbia Malleable Castings Corp. Columbia, Pa.	Malleable Iron Castings	6,000		429,000
Eastern Malleable Iron Co. Wilmington, Del.	Steel Castings	500		
	Malleable Iron Castings	1,500		
			Company Total	172,495
Fort Pitt Malleable Iron Co. McKees Rocks, Pa.	Malleable Iron Castings	7,200		412,500
General Malleable Corp. Waukesha, Wis.	Malleable Iron Castings	6,000		775,155
General Motors Corp. Danville, Ill.	Malleable Iron Castings	24,000	2,520,190	
			Company Total	4,406,190
Lake City Malleable Co. Inc. Ashtabula, O.	Malleable Iron Castings	24,000		4,688,514
Lehigh Foundries Inc. Easton, Pa.	Malleable Iron Castings	2,700		98,422
Texas Foundries Inc. Lufkin, Texas	Malleable Iron Castings	1,800		91,318
			Grand Total	11,755,264

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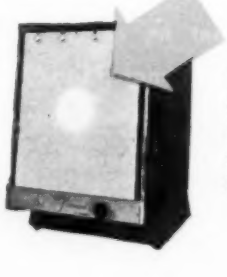

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Electronics at Work

(*Continued from page* 128)

totals further, it is shown that the steel foundries spent $46,802,176 of their own funds to expand production of steel castings, and $785,139 for the production of gray iron castings. Gray iron foundries themselves financed conversion to steel casting production in the amount of $2,258,438, and added to the gray iron capacity at a cost of $12,365,571 from their own funds. The malleable industry financed the conversion to steel casting production in the amount of $929,021, to gray iron production at a cost of $139,539, and provided $5,570,233 to expand malleable castings production.

A study of the government-financed projects shows that steel foundries used government funds in the amount of $138,807,796 to expand the production of steel castings and $1,080,000 for increasing malleable facilities. Gray iron foundries used $1,267,002 of government funds to convert to the production of steel castings, and $4,470,790 to increase production of gray iron castings. Malleable foundries had government financing to the extent of $96,298 for conversion to steel castings production and $11,658,966 for expansion of malleable capacity.

Detailed information on the cost and estimated tonnage increases for the various projects financed only by the government is presented in the accompanying tables.

A list of the foundries in the steel, gray iron and malleable iron classifications who financed expansion projects entirely with

(*Continued on page* 134)

GOVERNMENT FINANCED PROJECTS—INDEPENDENT STEEL CASTING COMPANIES

Name Address	Project	Estimated Increase Net Tons		Estimated or Completed Cost Dollars
American Radiator & Standard Sanitary Corp.				
Baltimore	Conversion of Gray Iron to Electric Steel Castings	18,000	383,412	
Pittsburgh	Conversion of Gray Iron to Electric Steel Castings	18,000	645,490	
			Company Total	1,028,902
American Steel Foundries				
Indiana Harbor, Ind.	Steel Castings	108,000		26,044,951
American Well & Prospecting Co.				
Corsicana, Tex.	Electric Steel Castings	600		328,000
Atlantic Steel Castings Co.				
Crum Lynne, Pa.	Electric Steel Castings	6,000		1,064,619
Auto Specialties Mfg. Co.				
Benton Harbor, Mich.	Electric Steel Castings	10,683	3,715,473	
St. Joseph, Mich.	Electric Steel Castings		8,854	
			Company Total	3,724,327
Beaird Co., J. B.				
Shreveport, La.	Electric Steel Castings			477,230
Birdsboro Steel Foundry & Machine Co.				
Birdsboro, Pa.	Steel Castings	30,000	1,447,946	
	Steel Castings	26,400	7,400,000	
			Company Total	8,847,946
Bison Castings Inc.				
Buffalo	Electric Steel Castings	5,000		279,718
Blaw-Knox Co.				
Blawnox, Pa.	Steel Armor Castings	1,200	110,674	
Pittsburgh, Pa.	Steel Armor Castings	6,000	2,064,175	
			623,452	
			37,050	
			Company Total	2,835,351
Bonney-Floyd Co.				
Columbus, O.	Steel Castings	1,870		161,903
Buckeye Steel Castings Co.				
Columbus, O.	Steel Armor Castings	4,680		908,419
Chapman Valve Mfg. Co.				
Indian Orchard, Mass.	Steel Castings	5,000		3,735,520
Columbia Steel Casting Co.				
Portland, Oreg.	Electric Steel Castings	12,000		1,126,638
Commercial Steel Casting Co.				
Marion, O.	Steel Castings	1,476		253,285
Continental Foundry & Machine Co.				
East Chicago, Ind.	Steel Armor Castings	13,500	2,163,816	
	Steel Armor Castings	30,000	5,696,582	
Coraopolis, Pa.	Steel Armor Castings	19,200	2,527,100	
Wheeling, W. Va.	Steel Armor Castings	13,500	1,253,084	
	Steel Armor Castings		365,028	
	Steel Armor Castings		80,000	
			Company Total	12,085,610
Cooper Alloy Foundry Co.				
Hillside, N. J.	Alloy Steel Castings	240		261,800
Crucible Steel Casting Co.				
Milwaukee	Steel Castings	9,000		2,042,389
Duraloy Co.				
Scottdale, Pa.	Centrifugal Castings	2,000		602,967
Falk Corp.				
Milwaukee	Steel Castings	1,200		557,233
Farrell-Cheek Steel Co.				
Sandusky, O.	Electric Steel Castings	4,380		641,219
General Alloys Co.				
Boston	Electric Alloy Castings	1,200		127,000
Grede Foundries Inc.				
Milwaukee	Steel Castings			49,925
Hart & Crouse Corp.				
Utica, N. Y.	Conversion of Gray Iron to Steel Castings	2,160		40,379
Hercules Mfg. Co.				
Centerville, Iowa	Steel Castings	2,400		179,227
Key Co.				
E. St. Louis, Ill.	Electric Steel Castings	5,400		1,795,200
Kincaid-Osburn Electric Steel Co.				
San Antonio, Tex.	Electric Steel Castings	1,800		79,074
Lakey Foundry & Machine Co.				
Muskegon, Mich.	Conversion of Gray Iron to Steel Castings	15,600	746,604	
	Steel Castings	5,000	449,504	
			Company Total	1,196,108
Ludlow Valve Mfg. Co.				
Troy, N. Y.	Steel Valve Castings	1,000		183,585
Mackintosh-Hemphill Co.				
Pittsburgh	Finished Castings			138,084

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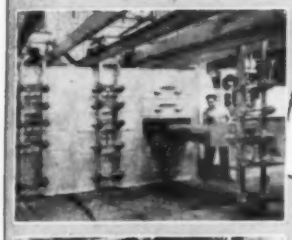
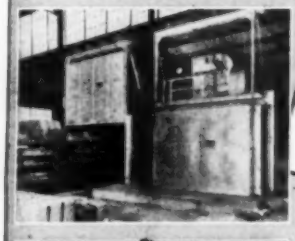
COLEMAN Portable Core Ovens

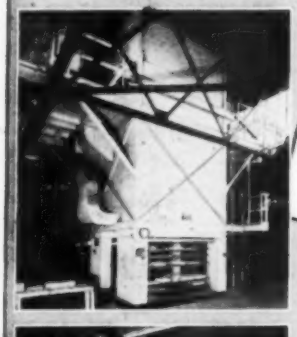


COLEMAN Rolling Drawer Ovens

COLEMAN Transrack Ovens

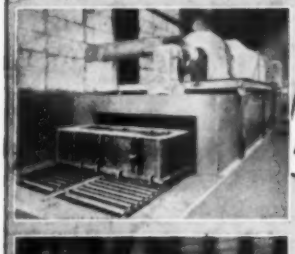


COLEMAN Car Type Ovens

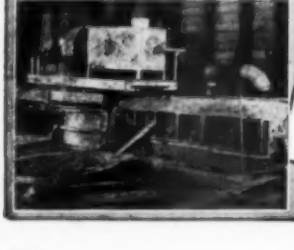


COLEMAN Tower Ovens

COLEMAN Horizontal Conveyor Ovens



COLEMAN Conveyor Mold Ovens



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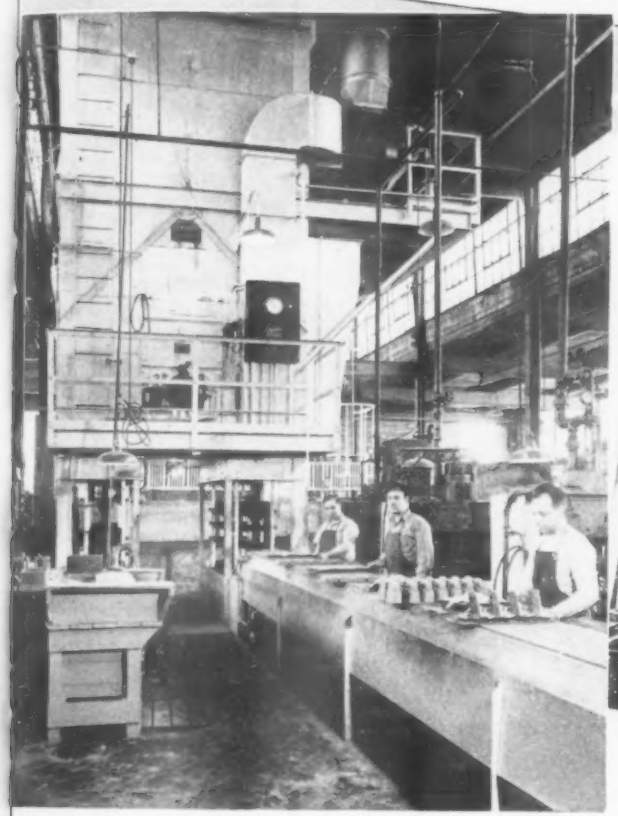

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COLEMAN
CORE AND MOLD
OVENS

(*Continued from page* 131)

their own funds is shown in the following listing. Detailed information on cost, etc., of these industry-financed projects was not given in the report, and these companies are not included in the tables.

STEEL FOUNDRIES

Allied Steel Castings Co., Harvey, Ill.; Alloy Steel & Metals Co., Los Angeles; American Cast Iron Pipe Co., Birmingham; American Foundry Equipment Co., Mishawaka, Ind.; American Hoist & Derrick Co., St. Paul; Atlantic Foundry Co., Akron; Atlas Foundry Co., Irvington, N. J.; Atlas Foundry & Machine Co., Tacoma, Wash.; Balmar Corp., Baltimore; Buckeye Traction Ditcher Co., Findlay, O.; Bucyrus-Erie, South Milwaukee, Wis.; Burnside Steel Foundry Co., Chicago; Calumet Steel Castings Corp., Hammond, Ind.; Chicago Steel Foundry Co., Chicago; Cincinnati Steel Castings Co., Cincinnati; Clarke Steele Inc., Los Angeles; Caldwell Foundry & Machine Co., Birmingham.

Crucible Steel Casting Co., Cleveland; Crucible Steel Casting Co., Landsdowne, Pa.; Cunningham Steel Foundry, Seattle; Detroit Steel Casting Co., Detroit; Dodge Steel Co., Philadelphia; Duncan Foundry & Machine Works Inc., Alton, Ill.; Duriron Co. Inc., Dayton, O.; Electric Steel Foundry Co., Portland, Oreg; Electrocast Steel Foundry Co., Cicero, Ill.; Empire Steel Castings Inc., Reading, Pa.; Enterprise Engine & Foundry Co., San Francisco; Fort Pitt Steel Casting Co., McKeesport, Pa.; General Electric Co., Schenectady, N. Y.; General Steel Castings Corp., Eddystone, Pa.; Glenwood Range Co., Taunton, Mass.; Gold, Milton B., Machine Works, Independence, Mo.; Hanford Foundry Co., San Bernardino, Calif; Hi-Alloy Casting Co., Ellwood City, Pa.

Kay-Brunner Steel Products Inc., Alhambra, Calif.; Kelsey-Hayes Wheel Co., Detroit; Keokuk Steel Casting Co., Keokuk, Iowa; George King Co. Inc., Sheffield, Ala.; Kinney Iron Works, Los Angeles; Lebanon Steel Foundry, Lebanon, Pa.; Lectromelt Steel Casting Co., Barberton, O.; Lenoir Car Works, Lenoir City, Tenn.; Link-Belt Co., Chicago; Los Angeles Steel Casting Co., Los Angeles; Lunkenheimer Co., Cincinnati; Machined Steel Casting Co., Alliance, O.; Madaras Steel Corp. of Texas, Longview, Tex.; Malcom Foundry Co. Inc., Newark, N. J.

Marion Steam Shovel Co., Marion, O.; Massillon Steel Casting Co., Massillon, O.; Maynard Electric Steel Castings Co., Milwaukee; Minneapolis Electric Steel Casting Co., Minneapolis; Monroe Steel Castings Co., Monroe, Mich.; Mountain State Steel Foundries, Parkersburg, W. Va.; National Roll & Foundry Co., Avonmore, Pa.; Nutmeg Crucible Steel Co.,

(*Continued on page* 156)

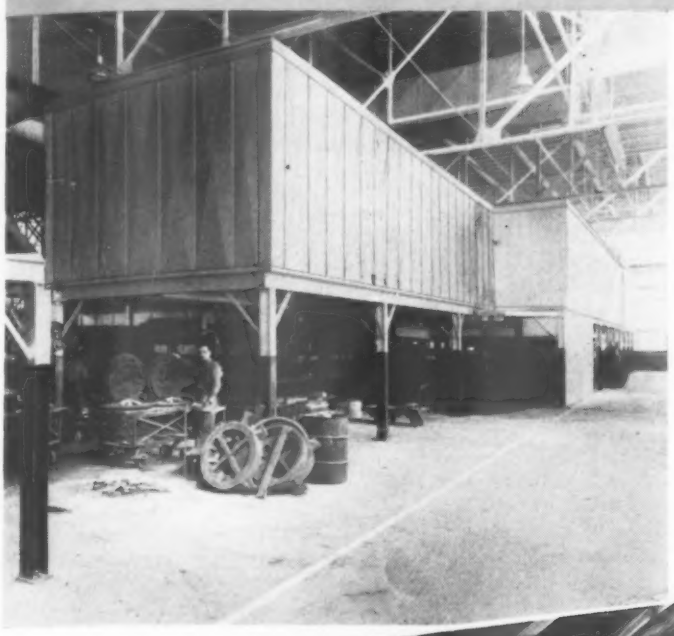
GOVERNMENT FINANCED PROJECTS—INDEPENDENT STEEL CASTING COMPANIES

(*Concluded from page* 131)

Name Address	Project	Estimated Increase Net Tons		Estimated or Completed Cost Dollars
Malleable Iron Fittings Co. Branford, Conn.	Steel Castings	2,810		209,611
McConway & Torley Corp. Pittsburgh	Steel Armor Castings			1,262,975
Michigan Steel Casting Co. Detroit	Steel Castings		171,791	
	Steel Castings		62,577	
			Company Total	234,368
National Erie Corp. Erie, Pa.	Steel Castings			550,000
National Malleable & Steel Castings Co. Cicero, Ill.	Malleable Iron Castings	19,200	1,080,000	
Melrose Park, Ill.	Electric Steel Castings		523,306	
			Company Total	1,603,306
Newport News Shipbuilding & Drydock Co. Newport News, Va.	Electric Steel Castings	1,200		119,738
Ohio Steel Foundry Co. Lima, O.	Finished Steel Castings		175,000	
	Electric Steel Castings	9,600	5,596,217	
	Electric Steel Castings	7,200	3,800,313	
Springfield, O.	Electric Steel Castings	5,400	2,034,334	
			Company Total	11,605,864
Oklahoma Steel Castings Co. Tulsa, Okla.	Electric Steel Castings	2,400		116,595
Omaha Steel Works Omaha, Nebr.	Electric Steel Castings	4,000		650,000
Ordnance Steel Foundry Co. Bettendorf, Iowa	Steel Castings	36,000		2,208,274
Otis Elevator Co. Buffalo	Electric Steel Castings	7,788		3,241,155
Pacific Car & Foundry Co. Renton, Wash.	Electric Steel Castings	1,500		2,887,000
Pennsylvania Electric Steel Castings Co. Hamburg, Pa.	Steel Castings	360		199,964
Penn Steel Castings Co. Chester, Pa.	Steel Castings	7,200		1,025,176
Pittsburgh Steel Foundry Corp. Glassport, Pa.	Steel Castings	18,000		6,644,163
Pratt & Letchworth Co. Inc. Buffalo	Steel Armor Castings			648,924
Roxbury Steel Casting Co. Boston	Steel Castings	2,100		371,866
Sawbrook Steel Castings Co. Lockland, O.	Steel Castings	4,800		317,861
Scullin Steel Co. St. Louis	Steel Castings	21,000	3,115,420	
	Steel Castings	72,000	13,192,451	
			Company Total	16,307,871
Shofner Iron & Steel Works Portland, Oreg.	Electric Steel Castings	1,500		315,000
Sivyer Steel Castings Co. Chicago	Electric Steel Castings	2,380		163,086
Sterling Alloys Inc. Woburn, Mass.	Electric Steel Castings	456		71,460
Symington-Gould Corp. Depew, N. Y.	Steel Armor Castings		2,601,179	
Rochester, N. Y.	Steel Armor Castings	5,400	1,163,196	
	Electric Steel Castings	36,000	7,276,865	
			Company Total	11,041,240
Texas Electric Steel Casting Co. Houston, Texas	Steel Armor Castings	4,800		758,122
Unitcast Corp. Toledo	Electric Steel Castings	7,440		3,900,000
Warman Steel Casting Co. Los Angeles, Calif.	Steel Castings			15,245
Wehr Steel Co. Milwaukee	Steel Castings	4,494		606,567
West Michigan Steel Foundry Co. Muskegon, Mich.	Electric Steel Castings	4,800		671,266
Worthington Pump & Machinery Corp. Harrison, N. J.	Steel Castings	1,600		765,390
Zimmerman Steel Casting Co. Bettendorf, Iowa	Steel Castings			79,000
			Grand Total	139,387,796

There's no better time to *invest* in modern

ROSS CORE OVENS



STATIONARY CONTINUOUS CONVEYOR

After V-Day, just as now, core quality and speed of production will be the chief factors in determining competitive standing. Whether Gray Iron, Magnesium or Aluminum, the future quality standard required of castings will demand better cores from which to make them. And core quality can be no better than the oven that bakes them.

ROSS Core Ovens, in a range of sizes and types for all requirements, are designed with the exclusive ROSS heating and circulating system that positively insures greater Uniformity, Elimination of Rejects, Increased Output in Less Time and in Less Space. The best proof of the remarkable performance of ROSS OVENS is the list of

Prominent Users:

Aluminum Company of America; American Locomotive Co.; Bohn Aluminum & Brass Co.; National Aluminum Cylinder Head Co.; Sperry Gyroscope Co. Inc.; Westinghouse Electric & Mfg. Co.; Wright Aeronautical Corporation—and many others.

The ROSS System of heating and circulation might be applied to improving your present oven. Why not ask us about this? No obligation.

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Around DETROIT

BY A. H. ALLEN
Detroit Editor, The Foundry

Ford gets flying start on passenger car assemblies . . . Captive automotive foundries face problem in restriction on car output, but gray iron plants as a whole will be busy

FORD lost no time in getting new passenger car assemblies rolling after the WPB flashed the official green light on July 1, and on July 3 the first 1946 models drove off the line at B building in the Rouge plant under their own power, while the event was recorded in pictures and stories by a score or more of newsmen on hand for the first "preview" in over 3½ years. It was hoped that about 400 cars could be completed during July, while schedules for this month point to 4000, moving up to 7000 for September.

Ford's quota for 1945 assemblies, assigned by the WPB, amounts to 39,910, or only a couple weeks' production at the 1941 level, and company officials say that unless this is increased appreciably it will be necessary to lay off approximately 50,000 at the Rouge plant where employment now is down 30 per cent from the peak wartime level, and 20 per cent under normal prewar figures. Production experts say materials are easily in sight for the present quota and would present no serious problem if quotas should be raised or perhaps even abandoned altogether.

Various Factors Help Ford

That Ford was able to make such a flying start on passenger cars can be explained by three factors: 1. War cutbacks were in greater volume and effected sooner than with other automotive plants; 2. A good stock of nearly all parts was on hand from the heavy "float" maintained when production was terminated abruptly in February, 1942, and 3. Production of trucks has been continuing all through the war years, and many parts are used both in the light truck and passenger car. As a matter of fact, while the first new passenger cars were being rolled from the assembly line, an adjoining line was moving light trucks off at a rate of 140 per day.

The 100-horsepower engine now used in the Ford V-8 passenger car was perfected during the war for truck use and is similar to the power plant used in the 1942 Mercury models. In addition to an increase of 10 hp in rating, the engine features a new type of tri-alloy bearing developed during the war to replace the cadmium-nickel type of bearing previously used. The new alloy, of lead, silver, copper and iron, is claimed to last three times as long as the former bearing, although because of the silver content it may prove to be somewhat more costly than the old type.

Production of double-face or floating bearings with a copper-lead coating proved to be difficult because of segregation of lead, but the addition of silver minimized the segregation, and the new alloy could be cast on the steel backing by the same method devised ten years ago for casting the copper-lead floating type bearing.

Improved cooling has been obtained in the engine by use of a radiator pressure cap which maintains constant pressure of 5 lb inside the radiator. Aluminum pistons cast in permanent molds and fitted with four rings and a heavier piston pin, coupled with an improved rear main bearing seal, are said to effect further economies in oil consumption. Compression ratio also is increased somewhat.

Adopt Aluminum Timing Gear

Longer life has been obtained in the camshaft timing gear by changing its specification to aluminum. Valves have been moved outward from the cylinders, permitting improved water jacketing and better cooling. Intake and exhaust valves seat on hardened steel inserts. Cylinder heads have been made interchangeable by a revised gasket design. Oil pump has been changed to provide greater circulation of lubricant. Fuel pump has been improved by addition of a sediment bulb which can be easily removed for cleaning.

Valve springs are shot peened and rustproofed to improve fatigue life, and a similar treatment is given the main leaf on each suspension spring. Spring leaves are somewhat thinner and their number increased.

A 6-cylinder engine is available in the new Ford line, which embodies most of the changes made in the V-8 power plant. General performance of the six has been stepped up by the use of a new, higher lift cam. The engine develops 90 hp at 3300 rpm. Exhaust manifold has been redesigned so that it is removed far enough from the fuel pump to eliminate possibility of vapor lock.

Outwardly the principal changes in appearance on the Ford line are centered in a redesigned front end with heavier horizontal sections in the grille. First models were resplendent in an abundance of chromium plate on bumpers, grilles, moldings, handles, etc., but it appears problematical how long this will last, since at a July 11 meeting in Washington the WPB indicated it could not relax full control over tin, cadmium, antimony, burlap and cotton linters, and chromic acid. The latter is essential to chromium plating and for the time being at least plating on decorative work seems out. It may still be used for functional purposes such as bushings, pins and other mechanical parts.

As far as tin and antimony are concerned, their use is principally in body solder and a possible substitute in the form of some lead alloy may be feasible. Cadmium can be changed to zinc without much difficulty, and consideration is being given to the use of a bright zinc plate combined with a colored dye treatment, such as dichromate, where chromium plating formerly has been used. The other alternative in bright work is to use paint, such as was done on the last of the 1942 models.

Restriction of passenger car production over the balance of the year to the equivalent of only a few weeks' production at prewar rates of output poses a serious problem for captive automotive foundries, since they obviously cannot very well gear down their rate of castings production to this point and spread it out over five months and wind up with anything but disastrously high costs.

Difficulties Become More Acute

On top of this place a generally abnormally low rate of labor productivity and the difficulty becomes even more acute. At first glance, it might appear the best policy for foundries to produce the required total of castings for the year's assemblies and then close down, but if quotas should suddenly be abandoned, they would have to go through all the motions of reopening, meanwhile having lost an appreciable amount of production.

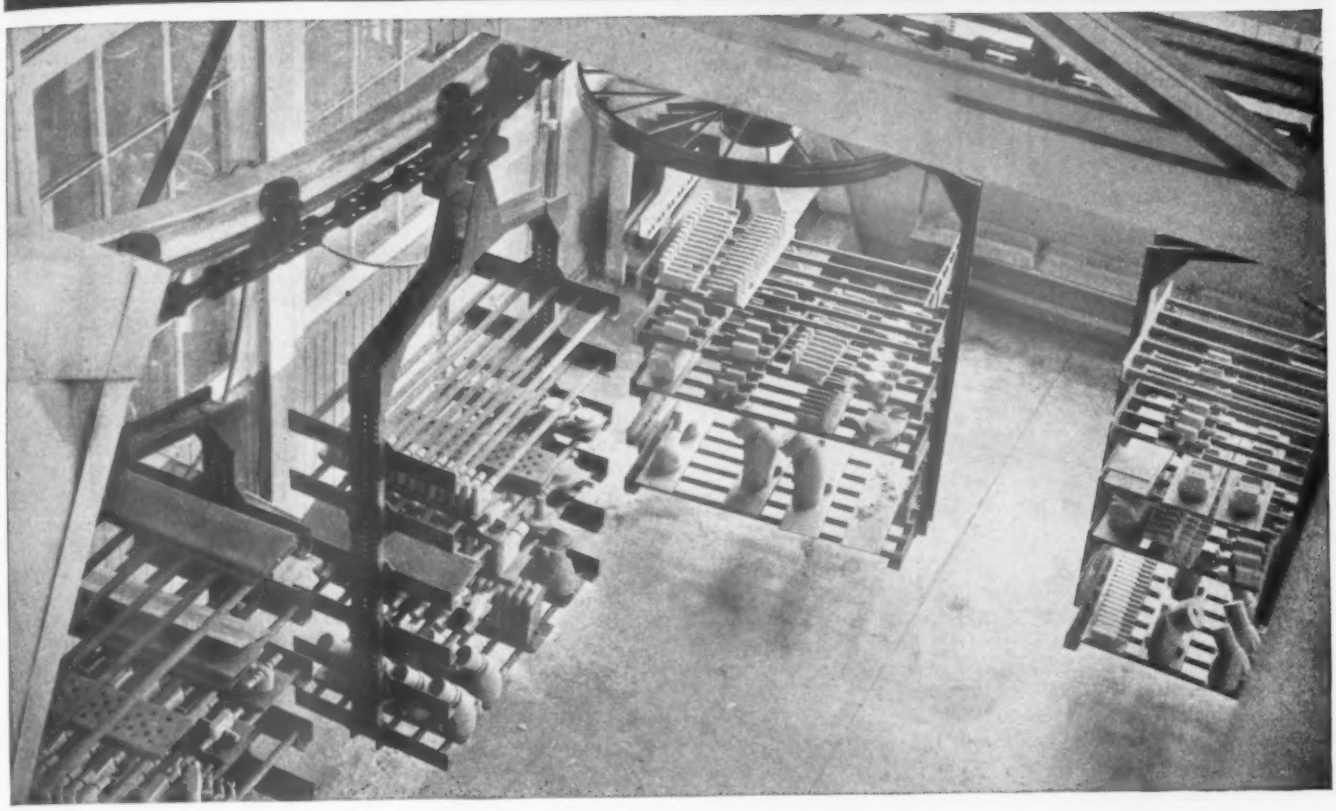
However, another factor bearing importantly on the situation is that light and medium truck schedules have been boosted to the highest point they have ever reached, the next five months calling for assembly of something over 500,000 of these commercial vehicles. Since from the standpoint of foundries, trucks require just as many if not more castings than passenger cars, there may be ample demand for foundry facilities, except for the fact most truck produc-

(*Concluded on page* 138)

Mathews

TROLLEY CONVEYERS

Engineered to serve Production



Trolley Conveyers are being applied in modern foundries for handling materials, usually cores and castings, through Production Departments, from one building to another, and in many other ways are operating to serve production. Transverse bends lower the loads to working height, keeping a continuous flow of materials reaching the working area. The conveyers do their work without occupying valuable floor and aisle space. They can serve one or several floor levels, and can be applied inside or outside the buildings. Variable speed drives make possible the exact control of the material reaching the working areas and the many types of hangers available add to the flexibility of the conveyers. Mathews Trolley Conveyers, like other prominent Mathews types for foundry application, are on the job today in many of the nation's great foundries. A Mathews Engineer operates in your vicinity, and would appreciate an opportunity to help you with that conveying problem.

Mathews Conveyer Company

ELLWOOD CITY, PENNSYLVANIA

(*Concluded from page* 136)

tion is concentrated in plants of the four principal suppliers — Ford, Chevrolet, Dodge and International Harvester.

Considering the entire gray iron foundry industry as a unit, the outlook for the next few months is for full use of facilities, particularly in view of the fact stepped-up demands will be coming out from manufacturers of textile machinery, refrigerators, washing machines, agricultural equipment and the like.

Extensive mechanization and modernization program at Albion Malleable Iron Co., Albion, Mich., under way for the past year or so, is now practically complete, and large truck orders should keep these facilities busy for months to come. Several new mold conveyor installations, a new sand handling system, new cupola charging equipment, a battery of new annealing furnaces and special turntable equipment for handling raw materials for charging are included in the program which runs to several million dollars.

First showing of the Willys-Overland civilian jeep was made a couple of weeks ago in Toledo and at the New Hudson, Mich., farm of G. E. Sorenson, president. The company has received authorization to produce 20,000 of these units over the balance of the year, along with the military jeeps which are still on order. The civilian model is quite similar to the military version and is expected to meet widespread demand in agricultural markets.

Industry BRIEFS

FINANCIAL control of the American Foundry Equipment Co., Mishawaka, Ind., has been acquired by First York Corp. and Utility Equities Corp., two investment companies in the Equity Corp. Group. Stock was acquired chiefly from the holdings of Verne E. Minich, chairman, who continues in that capacity. Other officers also are unchanged except that R. Sherrard Elliot Jr., vice president of Equity, has become secretary of American Foundry Equipment Co.

° ° °

Machine tool shipments in May amounted to $39,825,000, a decrease of 1.3 per cent compared with April, according to WPB. Unfilled orders decreased to $275,256,000, or 4.8 per cent from April. At the recent rate of shipment it will take the industry approximately 7 months to ship orders on hand as of the end of May. Value of net new orders received was $26,198,000, an increase of $7,189,000, or 37.8 per cent, compared with the previous month.

° ° °

Cooper Metallurgical Laboratories, Cleveland, has been acquired by Acme Aluminum Alloys Inc., Dayton, O. The Cleveland laboratories will continue operations as the Cooper Division, with Hugh C. Cooper as director. The Cooper company was started 4 years ago to do research and development on rare metals.

° ° °

Production of malleable iron castings in May totaled 83,013 tons, compared with 77,042 tons in April and 70,555 in May, 1944, according to the Bureau of the Census. Net orders booked were 83,421 tons in May, against 78,075 in April and 92,285 a year ago.

° ° °

April shipments of gray iron castings amounted to 773,988 tons, against 857,616 tons in March and 757,880 in April, 1944, the Bureau of the Census reports. Unfilled orders on April 30 totaled 2,640,642 tons, approximately 70 per cent being for sale and the balance for producers' own use.

° ° °

Award of the Army-Navy "E" to employees of National Roll & Foundry Co., Avonmore, Pa., has been made in recognition of outstanding contribution to the war effort in the production of tank armor and gun castings as well as iron and steel cast rolls, heavy iron and steel castings, and rolling mill equipment.

° ° °

Farrel-Birmingham Co. plants at Ansonia and Derby, Conn., and Buffalo, have been awarded the Navy "E" for the sixth time, in recognition of outstanding production records. The plants also fly the Maritime "M" and Victory Fleet flags.

° ° °

Central Specialty Co., Ypsilanti, Mich., has been acquired by King-Seeley Corp., Ann Arbor, Mich., and will be known as the Central Specialty Division of the latter company. The sale involves no changes in management or personnel.

° ° °

Building permit has been issued for construction of an addition to the plant of the Repcal Brass Mfg. Co., 2115 East 27th street, Vernon, Calif., to cost $20,000.

° ° °

Spencer Lens Co., Buffalo 11, which was acquired by American Optical Co., Southbridge, Mass., in 1935, is now known as the Scientific Instrument Division of that company, effective July 1.

° ° °

Foundry equipment orders placed in May represented 404.7 per cent of the 1937-1939 monthly average, according to the Foundry Equipment Manufacturers Association. This compares with 325 in April and 503.9 in May, 1944.

° ° °

Advance Aluminum & Brass Co., 1001 East Slauson Ave., Los Angeles, plans construction of a foundry building, 50 x 105 ft in area. Information as to cost is not yet available.

° ° °

Contract has been awarded for construction of a foundry building at 5210 Pacific Avenue, Huntington Park, Los Angeles, for I. H. Raber. The concrete and steel structure, to cover an area of 47 x 130 ft, will cost $15,000.

° ° °

Cast Metal Specialties Co., 3474 Union Pacific Ave., Los Angeles, is building an addition to its plant, to cover an area of 15 x 107 ft and to cost $2500.

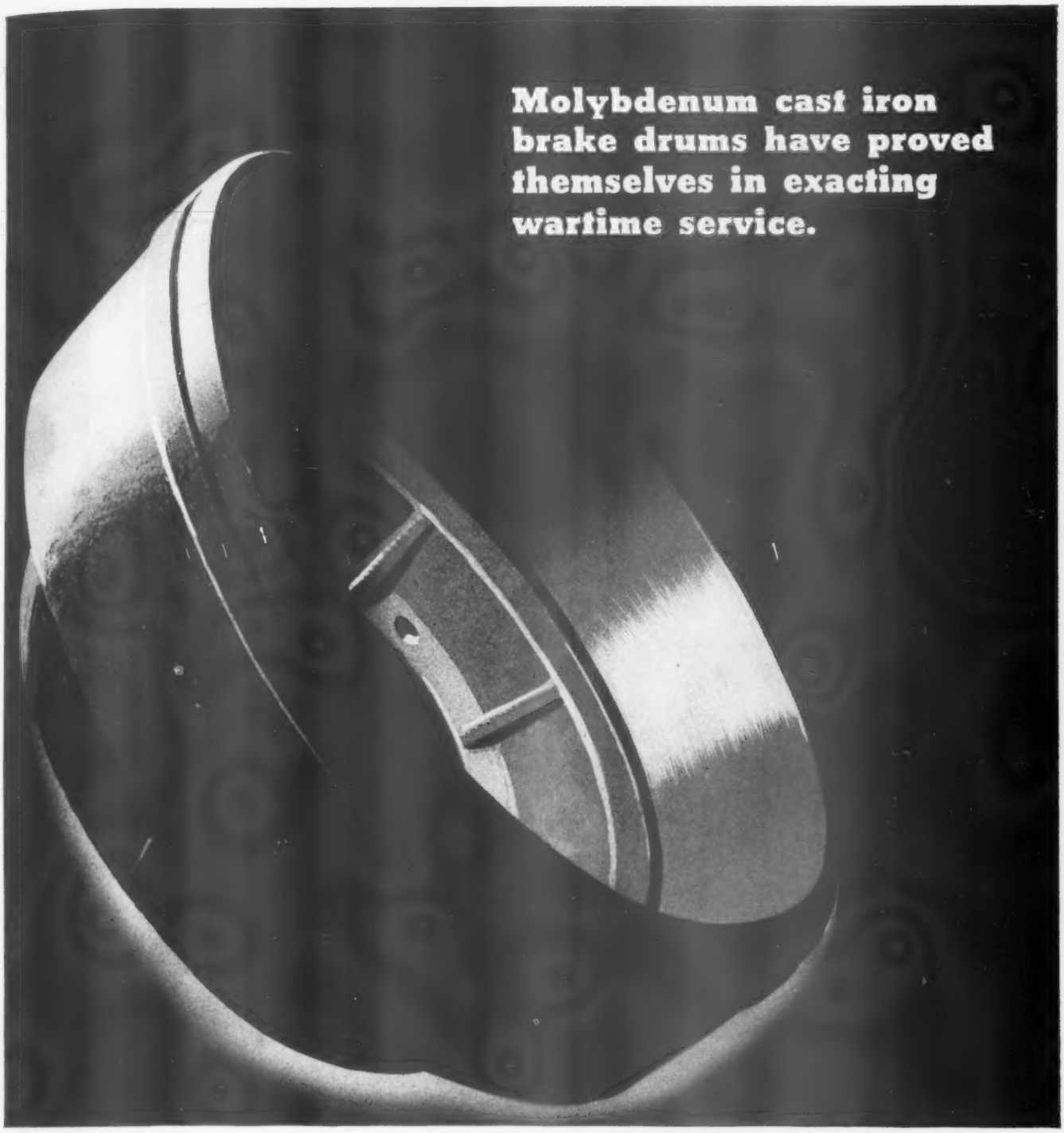
° ° °

Western Stove Works, 8536 Hayes St., Culver City, Calif., plans construction of three new plant buildings, to cost approximately $98,000.

° ° °

Solar Aircraft Co., San Diego, Calif., has purchased the precision casting division of B. F. Hirsch Inc., New York. Edmund T. Price, president of Solar Aircraft, has been made head of Solar Precision Castings Inc., the new subsidiary company.

"E" TO PATTERNMAKER: Scene at awarding of Army-Navy "E" to Deutsch & Sons Template Works and Deutsch Pattern Works, Milwaukee, shows, left to right: Lt. Col. Millard Frohock, who presented the pennant; Erwin Bishoff of the template division; Simon Deutsch, president of the company; William Stark of the pattern division, and Lt. Comdr. Milton D. Traxler, who presented the "E" pins



CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

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Climax Molybdenum Company

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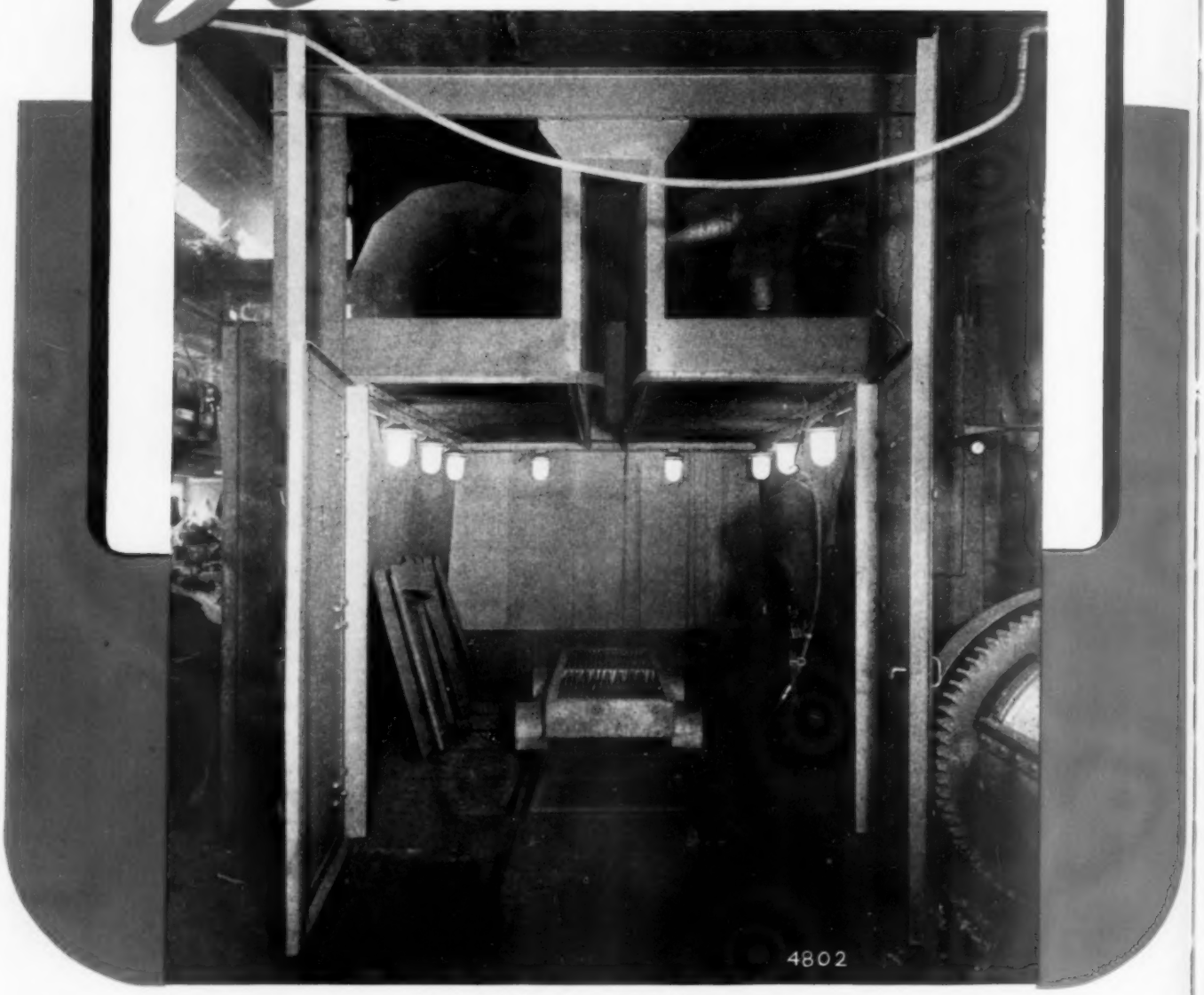
MOLY

SLY BLAST ROOMS *Better-Built* OFFER EXCLUSIVE ADVANTAGES



A typical Sly Blast Room for a jobbing foundry

Castings of moderate weight are placed against the sidewall for cleaning as shown; heavier castings are handled on the car. Provision has also been made for future installation of a monorail.

Excellent illumination—from an ample number of dust-tight lighting fixtures.

Construction is exceptionally rigid—walls and doors have an extra layer of steel (3/16" wear plates).

The ceiling is of *triple* construction and provides over-all down-draft ventilation.

The floor is made of grating and perforated plates. It is unmatched for strength and safety.

Before you buy, it will pay you to look into these exceptional features of Sly Blast Rooms. We shall be glad to send you full information or arrange for representative to call.

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SLY INDUSTRIAL DUST CONTROL

TUMBLING MILLS • BLAST CLEANING EQUIPMENT

TENTATIVE SPECIFICATIONS FOR AUTOMOTIVE GRAY IRON CASTINGS

(From ASTM Tentative Specifications A159-44T)

(Concluded from July issue)

A1. The data in this appendix are furnished as information only and do not constitute a part of these specifications.

A2. Chemical Composition.—The typical base compositions shown in Table II are furnished as information only and are not to be construed as required or sufficient. In some cases, it may be desirable to use alloying elements to obtain the specific service requirements demanded. The kind and amount of the alloy constituents used should be a matter of agreement between the manufacturer and the purchaser.

TABLE III.—Residual and Alloy Ranges.*

Elements	Permissible Residuals in Base Iron, per cent	Recommended Ranges (For Specification Purposes) from Mean Specified Alloy Content, plus or minus, per cent
Nickel	0 to 0.20	0.15
Molybdenum	0 to 0.08	0.075
Chromium	0 to 0.10	0.10
Copper	0 to 0.20	0.10
Vanadium	0 to 0.03	0.03

* By agreement between the manufacturer and the purchaser, closer or wider limits than shown in this table may be acceptable.

A3. Alloying Elements.—When alloying elements are specified, Table III shows the practical range for commercial limits.

A4. Suggested Uses.—Suggested uses for the several automotive gray iron castings prescribed in these specifications may be classified as follows:

No. 110—Miscellaneous soft iron castings in which strength is not of primary consideration. (Either as cast or annealed.)

No. 111.—Small cylinder blocks, cylinder heads, air-cooled cylinders, pistons, clutch plates, oil pump bodies, transmission cases, gear boxes, clutch housings, lightweight brake drums, etc.

No. 120.—Automobile cylinder blocks, cylinder heads, flywheels, truck brake drums, cylinder sleeves, cylinder liners, pistons, etc.

No. 121—Truck and tractor cylinder blocks and heads, heavy flywheels, tractor transmission cases, differential carrier castings, heavy gear boxes.

No. 122.—Diesel engine castings, liners, cylinders, pistons, and heavy parts in general.

ENGINEERING CONVERSION FACTORS

Multiply	by	To Obtain
centimeters	0.032808	feet
centimeters	0.3937	inches
square millimeters	0.001550	square inches
square centimeters	0.1550	square inches
cubic centimeters	0.000035314	cubic feet
cubic centimeters	0.06102	cubic inches
cubic meters	1.30794	cubic yards
grams metric	0.0022046	pounds avoirdupois
kilograms	2.2046	pounds avoirdupois
kilograms	0.0011023	tons (2000 lb)
kilogram-meters	7.233	foot-pounds
kilograms per square centimeter	14.2234	pounds per square inch
kilograms per square meter	0.2048	pounds per square foot
kilograms per square millimeter	1422.34	pounds per square inch
kilograms per cubic meter	0.062428	pounds per cubic foot
liters	0.26417	gallons U. S.
liters	0.0353145	cubic feet
horsepower metric	0.98632	horsepower U. S.
meters	3.2808	feet
meters	39.37	inches
meters	1.0936	yards
feet	0.3048	meters
feet	30.4801	centimeters
inches	0.0254	meters
inches	2.54	centimeters
square inches	645.163	square millimeters
square inches	6.45163	square centimeters
cubic feet	28317	cubic centimeters
cubic inches	16.38716	cubic centimeters
cubic inches	0.00433	meters
cubic yards	0.76455	cubic meters
pounds avoirdupois	453.592	grams metric
pounds avoirdupois	0.453592	kilograms
tons (2000 lb)	907.185	kilograms
foot-pounds	0.13826	kilogram-meters
pounds per square inch	0.07031	kilograms per square centimeter
pounds per square inch	0.0007031	kilograms per square millimeter
pounds per square foot	4.8824	kilograms per square meter
pounds per cubic foot	16.0184	kilograms per cubic meter
gallons U. S.	3.7854	liters
cubic feet	28.317	liters
cubic feet	6.22905	gallons British imperial
horsepower U. S.	1.01387	horsepower metric
feet	0.3048	meters
gallons British imperial	0.160538	cubic feet
gallons British imperial	1.2009	gallons U. S.
gallons U. S.	0.8327	gallons British imperial
gallons U. S.	231	cubic inches

CENTIGRADE-FAHRENHEIT TEMPERATURE CONVERSION TABLES

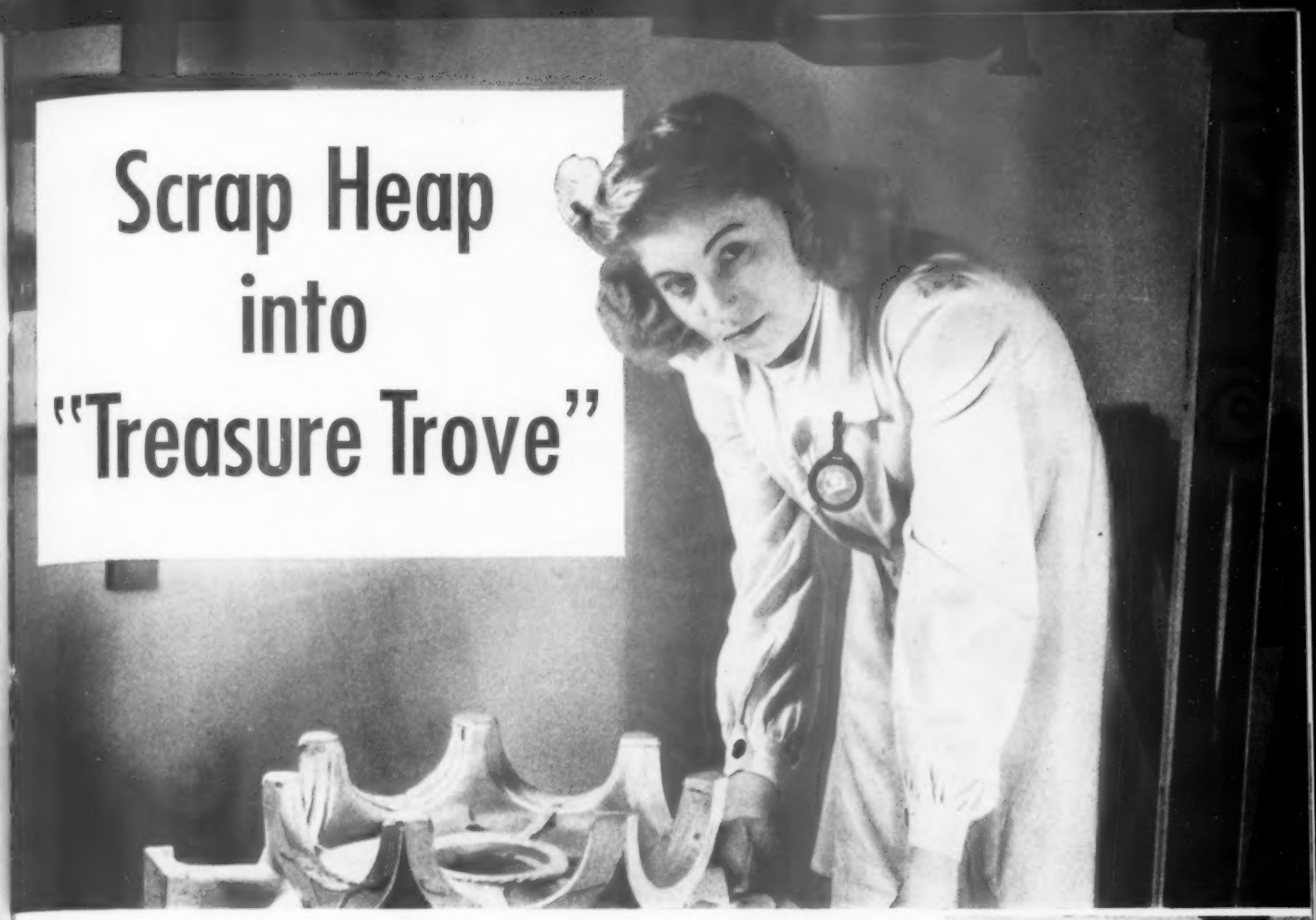
NOTE:—The numbers in bold face type refer to the temperature either in degrees Centigrade or Fahrenheit which it is desired to convert into the other scale. If converting from Fahrenheit degrees Centigrade degrees the equivalent temperature will be found in the left column, while if converting from degrees Centigrade to degrees Fahrenheit, the answer will be found in the column on the right.

C.		F.	C.		F.	C.		F.	C.		F.	C.		F.	C.		F.	C.		F.	C.		F.	C.		F.
—17.8	**0**	32	7.22	**45**	113.0	32.2	**90**	194.0	227	**440**	824	471	**880**	1616	716	**1320**	2408	960	**1760**	3200	1204	**2200**	3992	1449	**2640**	4784
—17.2	**1**	33.8	7.78	**46**	114.8	32.8	**91**	195.8	232	**450**	842	477	**890**	1634	721	**1330**	2426	966	**1770**	3218	1210	**2210**	4010	1454	**2650**	4802
—16.7	**2**	35.6	8.33	**47**	116.6	33.3	**92**	197.6	238	**460**	860	482	**900**	1652	727	**1340**	2444	971	**1780**	3236	1216	**2220**	4028	1460	**2660**	4820
—16.1	**3**	37.4	8.89	**48**	118.4	33.9	**93**	199.4	243	**470**	878	488	**910**	1670	732	**1350**	2462	977	**1790**	3254	1221	**2230**	4046	1466	**2670**	4838
—15.6	**4**	39.2	9.44	**49**	120.2	34.4	**94**	201.2	249	**480**	896	493	**920**	1688	738	**1360**	2480	982	**1800**	3272	1227	**2240**	4064	1471	**2680**	4856
—15.0	**5**	41.0	10.0	**50**	122.0	35.0	**95**	203.0	254	**490**	914	499	**930**	1706	743	**1370**	2498	988	**1810**	3290	1232	**2250**	4082	1477	**2690**	4874
—14.4	**6**	42.8	10.6	**51**	123.8	35.6	**96**	204.8	260	**500**	932	504	**940**	1724	749	**1380**	2516	993	**1820**	3308	1238	**2260**	4100	1482	**2700**	4892
—13.9	**7**	44.6	11.1	**52**	125.6	36.1	**97**	206.6	266	**510**	950	510	**950**	1742	754	**1390**	2534	999	**1830**	3326	1243	**2270**	4118	1488	**2710**	4910
—13.3	**8**	46.4	11.7	**53**	127.4	36.7	**98**	208.4	271	**520**	968	516	**960**	1760	760	**1400**	2552	1004	**1840**	3344	1249	**2280**	4136	1493	**2720**	4928
—12.8	**9**	48.2	12.2	**54**	129.2	37.2	**99**	210.2	277	**530**	986	521	**970**	1778	766	**1410**	2570	1010	**1850**	3362	1254	**2290**	4154	1499	**2730**	4946
—12.2	**10**	50.0	12.8	**55**	131.0				282	**540**	1004	527	**980**	1796	771	**1420**	2588	1016	**1860**	3380	1260	**2300**	4172	1504	**2740**	4964
—11.7	**11**	51.8	13.3	**56**	132.8	38	**100**	212	288	**550**	1022	532	**990**	1814	777	**1430**	2606	1021	**1870**	3398	1266	**2310**	4190	1510	**2750**	4982
—11.1	**12**	53.6	13.9	**57**	134.6	43	**110**	230	293	**560**	1040	538	**1000**	1832	782	**1440**	2624	1027	**1880**	3416	1271	**2320**	4208	1516	**2760**	5000
—10.6	**13**	55.4	14.4	**58**	136.4	49	**120**	248	299	**570**	1058	543	**1010**	1850	788	**1450**	2642	1032	**1890**	3434	1277	**2330**	4226	1521	**2770**	5018
—10.0	**14**	57.2	15.0	**59**	138.2	54	**130**	266	304	**580**	1076	549	**1020**	1868	793	**1460**	2660	1038	**1900**	3452	1282	**2340**	4244	1527	**2780**	5036
— 9.44	**15**	59.0	15.6	**60**	140.0	60	**140**	284	310	**590**	1094	554	**1030**	1886	799	**1470**	2678	1043	**1910**	3470	1288	**2350**	4262	1532	**2790**	5054
— 8.89	**16**	60.8	16.1	**61**	141.8	66	**150**	302	316	**600**	1112	560	**1040**	1904	804	**1480**	2696	1049	**1920**	3488	1293	**2360**	4280	1538	**2800**	5072
— 8.33	**17**	62.6	16.7	**62**	143.6	71	**160**	320	321	**610**	1130	566	**1050**	1922	810	**1490**	2714	1054	**1930**	3506	1299	**2370**	4298	1543	**2810**	5090
— 7.78	**18**	64.4	17.2	**63**	145.4	77	**170**	338	327	**620**	1148	571	**1060**	1940	816	**1500**	2732	1060	**1940**	3524	1304	**2380**	4316	1549	**2820**	5108
— 7.22	**19**	66.2	17.8	**64**	147.2	82	**180**	356	332	**630**	1166	577	**1070**	1958	821	**1510**	2750	1066	**1950**	3542	1310	**2390**	4334	1554	**2830**	5126
— 6.67	**20**	68.0	18.3	**65**	149.0	88	**190**	374	338	**640**	1184	582	**1080**	1976	827	**1520**	2768	1071	**1960**	3560	1316	**2400**	4352	1560	**2840**	5144
— 6.11	**21**	69.8	18.9	**66**	150.8	93	**200**	392	343	**650**	1202	588	**1090**	1994	832	**1530**	2786	1077	**1970**	3578	1321	**2410**	4370	1566	**2850**	5162
— 5.56	**22**	71.6	19.4	**67**	152.6	99	**210**	410	349	**660**	1220	593	**1100**	2012	838	**1540**	2804	1082	**1980**	3596	1327	**2420**	4388	1571	**2860**	5180
— 5.00	**23**	73.4	20.0	**68**	154.4	104	**220**	428	354	**670**	1238	599	**1110**	2030	843	**1550**	2822	1088	**1990**	3614	1332	**2430**	4406	1577	**2870**	5198
— 4.44	**24**	75.2	20.6	**69**	156.2	110	**230**	446	360	**680**	1256	604	**1120**	2048	849	**1560**	2840	1093	**2000**	3632	1338	**2440**	4424	1582	**2880**	5216
— 3.89	**25**	77.0	21.1	**70**	158.0	116	**240**	464	366	**690**	1274	610	**1130**	2066	854	**1570**	2858	1099	**2010**	3650	1343	**2450**	4442	1588	**2890**	5234
— 3.33	**26**	78.8	21.7	**71**	159.8	121	**250**	482	371	**700**	1292	616	**1140**	2084	860	**1580**	2876	1104	**2020**	3668	1349	**2460**	4460	1593	**2900**	5252
— 2.78	**27**	80.6	22.2	**72**	161.6	127	**260**	500	377	**710**	1310	621	**1150**	2102	866	**1590**	2894	1110	**2030**	3686	1354	**2470**	4478	1599	**2910**	5270
— 2.22	**28**	82.4	22.8	**73**	163.4	132	**270**	518	382	**720**	1328	627	**1160**	2120	871	**1600**	2912	1116	**2040**	3704	1360	**2480**	4496	1604	**2920**	5288
— 1.67	**29**	84.2	23.3	**74**	165.2	138	**280**	536	388	**730**	1346	632	**1170**	2138	877	**1610**	2930	1121	**2050**	3722	1366	**2490**	4514	1610	**2930**	5306
— 1.11	**30**	86.0	23.9	**75**	167.0	143	**290**	554	393	**740**	1364	638	**1180**	2156	882	**1620**	2948	1127	**2060**	3740	1371	**2500**	4532	1616	**2940**	5324
— 0.56	**31**	87.8	24.4	**76**	168.8	149	**300**	572	399	**750**	1382	643	**1190**	2174	888	**1630**	2966	1132	**2070**	3758	1377	**2510**	4550	1621	**2950**	5342
0	**32**	89.6	25.0	**77**	170.6	154	**310**	590	404	**760**	1400	649	**1200**	2192	893	**1640**	2984	1138	**2080**	3776	1382	**2520**	4568	1627	**2960**	5360
0.56	**33**	91.4	25.6	**78**	172.4	160	**320**	608	410	**770**	1418	654	**1210**	2210	899	**1650**	3002	1143	**2090**	3794	1388	**2530**	4586	1632	**2970**	5378
1.11	**34**	93.2	26.1	**79**	174.2	166	**330**	626	416	**780**	1436	660	**1220**	2228	904	**1660**	3020	1149	**2100**	3812	1393	**2540**	4604	1638	**2980**	5396
1.67	**35**	95.0	26.7	**80**	176.0	171	**340**	644	421	**790**	1454	666	**1230**	2246	910	**1670**	3038	1154	**2110**	3830	1399	**2550**	4622	1643	**2990**	5414
2.22	**36**	96.8	27.2	**81**	177.8	177	**350**	662	427	**800**	1472	671	**1240**	2264	916	**1680**	3056	1160	**2120**	3848	1404	**2560**	4640	1649	**3000**	5432
2.78	**37**	98.6	27.8	**82**	179.6	182	**360**	680	432	**810**	1490	677	**1250**	2282	921	**1690**	3074	1166	**2130**	3866	1410	**2570**	4658			
3.33	**38**	100.4	28.3	**83**	181.4	188	**370**	698	438	**820**	1508	682	**1260**	2300	927	**1700**	3092	1171	**2140**	3884	1416	**2580**	4676			
3.89	**39**	102.2	28.9	**84**	183.2	193	**380**	716	443	**830**	1526	688	**1270**	2318	932	**1710**	3110	1177	**2150**	3902	1421	**2590**	4694			
4.44	**40**	104.0	29.4	**85**	185.0	199	**390**	734	449	**840**	1544	693	**1280**	2336	938	**1720**	3128	1182	**2160**	3920	1427	**2600**	4712			
5.00	**41**	105.8	30.0	**86**	186.8	204	**400**	752	454	**850**	1562	699	**1290**	2354	943	**1730**	3146	1188	**2170**	3938	1432	**2610**	4730			
5.56	**42**	107.6	30.6	**87**	188.6	210	**410**	770	460	**860**	1580	704	**1300**	2372	949	**1740**	3164	1193	**2180**	3956	1438	**2620**	4748			
6.11	**43**	109.4	31.1	**88**	190.4	216	**420**	788	466	**870**	1598	710	**1310**	2390	954	**1750**	3182	1199	**2190**	3974						
6.67	**44**	111.2	31.7	**89**	192.2	221	**430**	806																		

Interpolation Factors

C		F
0.556	1	1.8
1.11	2	3.6
1.67	3	5.4
2.22	4	7.2
2.78	5	9.0

Scrap Heap into "Treasure Trove"



How RADIOGRAPHY reclaimed $35,000 worth of castings from an $840 scrap pile

Almost as dramatic as a Yukon "gold strike," here's a case history of radiography speeding production . . . rescuing $35,000 worth of castings from the scrap pile . . .

Costly, complicated to cast, these 40-pound housings demanded—and received—the most precise casting technics. But in spite of all precautions, flaws were unavoidable . . . deliveries fell behind requirements.

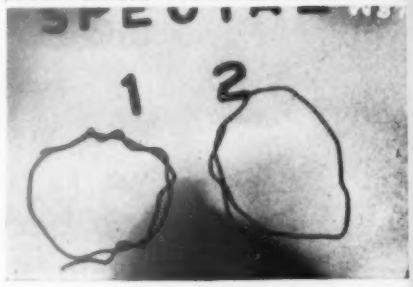
The suggested remedy was repair welds. But how could they be proved sound?

How? The foundry used radiography to locate the internal irregularities . . . then made the welded repairs and x-rayed them. Study of the new radiographs showed the repaired castings to be acceptable. The 350 castings which were thus salvaged each month brought deliveries up to schedule—with a monthly saving of thousands of dollars.

This case history—repeated in many industries—shows how radiography serves as a design and improvement tool . . . as well as an inspector. Tremendously increasing industrial output, under rigid inspection standards, radiography has more than "won its wings." Tomorrow, it will be an even greater *must*. Why not investigate its possibilities for you, *now*? See your local x-ray equipment dealer.

Investigation discloses irregularity. A flaw typical of those which slowed the foundry's deliveries on these complex housings.

Welding repairs the condition . . . BUT: Is the weld sound, is penetration satisfactory and metal well fused? Will the casting meet inspection requirements?



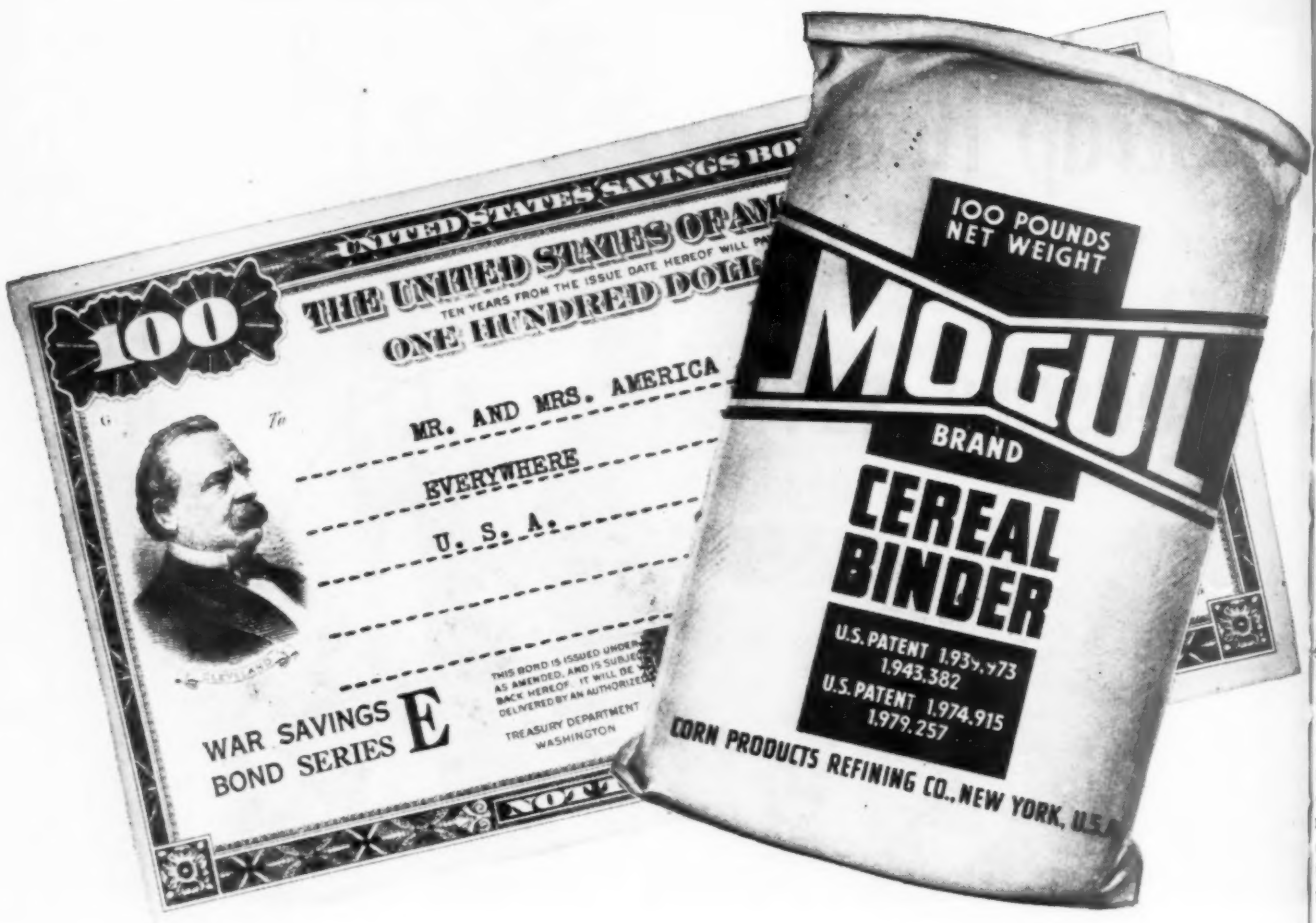
Radiography approves the repair: "Yes," says this radiograph—welding has made the rejected casting sound, sturdy, acceptable—and ready to use.

EASTMAN KODAK COMPANY, *X-ray Division*, Rochester 4, N. Y.

RADIOGRAPHY

ANALYZES . . . INSTRUCTS . . . CORRECTS . . . IMPROVES

Kodak



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INVEST in War Bonds first. Then invest in MOGUL, because it helps you realize the goal of every foundry man . . . steady profitable production with minimum discards.

MOGUL is a perfect Green Bond, which increases permeability in cores. Use MOGUL in cores for both green and dry strength.

MOGUL works with core oil; it decreases drying time and yields smooth cores. MOGUL works perfectly with pitch or resin, too, because cores can be handled while still warm. MOGUL is widely used with sharp sands.

KORDEK

KORDEK is a perfect DRY BOND which can be used in smaller quantities than most dry binders. KORDEK produces better castings with fewer discards.

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Activities of foundry GROUPS

New England

REGULAR monthly meeting of the New England Foundrymen's Association, held June 13 at the Engineers' Club, Boston, was attended by 120 members and guests.

M. E. Kohler, Scientific Cast Products Corp., Cleveland, was guest speaker and gave a most interesting and instructive talk on "Pattern Equipment Cast in Plaster," which he supplemented with slides showing the possibilities of multiple patterns. Calling attention to the small cost of duplicating patterns by this method, the speaker cautioned against sending original patterns away for the purpose of making up matchplates, which if not carefully packed to avoid shifting of runners, may result in imperfectly reproduced duplicate patterns. At the conclusion of the address Mr. Kohler answered questions in connection with the talk.

Merton Hosmer, chapter president, announced with regret the death of Pat Jordan, long a member of the association and well known in the local foundry industry.

Annual outing of the chapter will be held Aug. 8 at the Pawtucket Golf Club, Pawtucket, R. I.—**Merton A. Hosmer, president.**

Western New York

ANNUAL meeting of the Western New York Chapter of the AFA was held June 16 at Hotel Buffalo, with 160 members and guests in attendance. Membership Chairman Leslie C. Thellemann reported a total chapter membership of 253. Program Chairman Arthur H. Suckow reviewed the regular meetings and special events held during the year and Chapter Chairman Reinhold D. Loesch introduced the chairmen of the special events.

The following officers and directors were announced for the coming year: Chairman, Arthur H. Suckow, Symington-Gould Corp., Depew; vice chairman, Henry C. Winte, Worthington Pump & Machinery Corp., Buffalo; secretary, Leo A. Merryman, Tonawanda Iron Corp., North Tonawanda; treasurer, Martin W. Pohlman, Pohlman Foundry Co. Inc., Buffalo; directors for 3 years, John C. Goetz, Acme Steel & Malleable Iron Works, Buffalo; Frank T. McQuillin, Standard Buffalo Foundry Inc., Buffalo; Avitus J. Heysel, E. J. Woodison Co., Buffalo. Reinhold D. Loesch was elected director for 1 year.

Mr. Winte, who will head the program committee, stated that roundtable discussions on subjects of interest would be held at one of the meetings during the coming year. Mr. Loesch presented the gavel to Chairman-Elect Suckow, who in his acceptance speech asked for the continued support and co-operation of all members. Past Chairman Frank E. Bates presented the past chairman's pin to retiring Chairman Loesch and welcomed him into the fold of past chairmen of Western New York Chapter. Mr. Bates pointed out that Mr. Loesch was expected to follow the example of the various past chairmen who are still active both in the local chapter and nationally.

An excellent floor show and refreshments followed the meeting and good fellowship continued until late in the evening.—*J. Ralph Turner, secretary.*

Northwestern Pennsylvania

OFFICIAL organization of the 31st chapter of the AFA took place at Erie, Pa., June 25 before a meeting of approximately 80 members and guests. Robert E. Kennedy, national secretary, announced approval by the board of directors of the petitions submitted by the Erie group, thereby forming the new Northwestern Pennsylvania chapter. The cast iron rattle, emblematic of the association's "baby" chapter, was presented by Mr. Kennedy following election of officers.

The following constitute the first officers and directors of the new chapter: Chairman, Roger W. Griswold Jr., foundry superintendent, the Griswold Mfg. Co., Erie; vice chairman, Earl M. Strick, finishing superintendent, Erie Malleable Iron Co., Erie; secreary, H. L. Gebhardt, president, United Oil Mfg. Co., Erie; treasurer, Ray W. Britton, president, Urick Foundry Co., Erie.

Directors (one year): J. L. Skinner, president, Skinner Engine Co., Erie; Kenneth T. Guyer, foundry superintendent, Bucyrus-Erie Co., Erie; Lawrence Dunn, superintendent of foundries, General Electric Co., Erie; Ralph T. Wedgewood, district sales manager, Pickands, Mather & Co., Erie.

Directors (two years): Roger D. Carver, foundry superintendent, Standard Stoker Co., Erie; J. S. Hornstein, general manager, Meadville Malleable Iron Co., Meadville, Pa.; William J. Miller, district sales manager, Frederic B. Stevens Inc., Erie.

Directors (three years): Clarence Fitz, foundry superintendent, Hays Mfg. Co., Erie; T. H. Beaulac, foundry superintendent, Chicago Pneumatic Tool Co., Franklin, Pa.; Douglas J. James, foundry metallurgist, Erie City Iron Works, Erie.

Fred G. Sefing, International Nickel Co., New York, was technical speaker of the evening, giving an interesting illustrated talk on "Special Molding Methods for the Production of Sound Castings." Mr. Sefing pointed out that the amount of metal required to feed castings will vary with metal composition, but that the general rules of controlled directional solidification apply to all types of castings; also, that pouring temperature is more important than melting temperature.

He recommended making the riser 50 per cent larger in thickness than the casting section to be fed, and showed a number of slides illustrating the proper method of gating and risering to insure that the metal in the riser would be the last to freeze. In conclusion, Mr. Sefing urged foundries to keep good records by marking their drawings and photographing their castings so that techniques developed the hard way will not be forgotten when the same job again is handled some time in the future.

A number of out-of-town guests and representatives from other chapters attended the meeting, including Russell F. Lincoln, Russell F. Lincoln & Co., Cleveland; Charles J. Nock, Nock & Sons Co., Cleveland; Gilbert J. Nock, Nock Fire Brick Co., Cleveland; Don Rishor, Rochester, N. Y.; C. H. Rupp, Jewell Alloy Co., Buffalo, and William G. Gude, THE FOUNDRY, Cleveland.

The next meeting of the chapter will be held in September or October at a time and place to be announced shortly. Meanwhile, the directors are making plans for a series of interesting meetings for the coming year.—*H. L. Gebhardt, secretary.*

Southern California

BECAUSE the human element, that is, individual dexterity and skill, count largely in foundry operations, the training of apprentice coremakers, molders, patternmakers and others is becoming more important as the industry grows, James G. Russell, of the War Manpower Commission, told a large meeting of the Southern California Chapter of the AFA, held at the Los Angeles Elks Club, June 22.

"We have depended too long on foreign nations for skilled journeymen," Mr. Russell declared. "I have been both foundryman and machinist and by way of comparison I believe that molder and coremaker techniques demand as much or more skill as machine operation."

The speaker urged his hearers to contact the WMC office for details as to apprentice training plans. He pointed out that only a handful of Southern California foundries have as yet launched training programs for apprentices.

James W. Ball, assistant technical director for Triplett & Barton Inc., second speaker of the evening, told his hearers

(*Continued on page* 148)

INTERNATIONAL MOLDING MACHINES

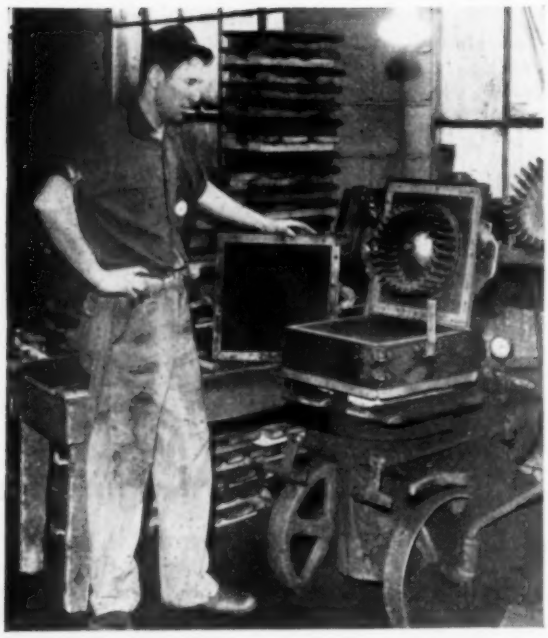
are busy in foundries all over the United States performing their vital part in the war program. Where High Production is important, Foundrymen specify

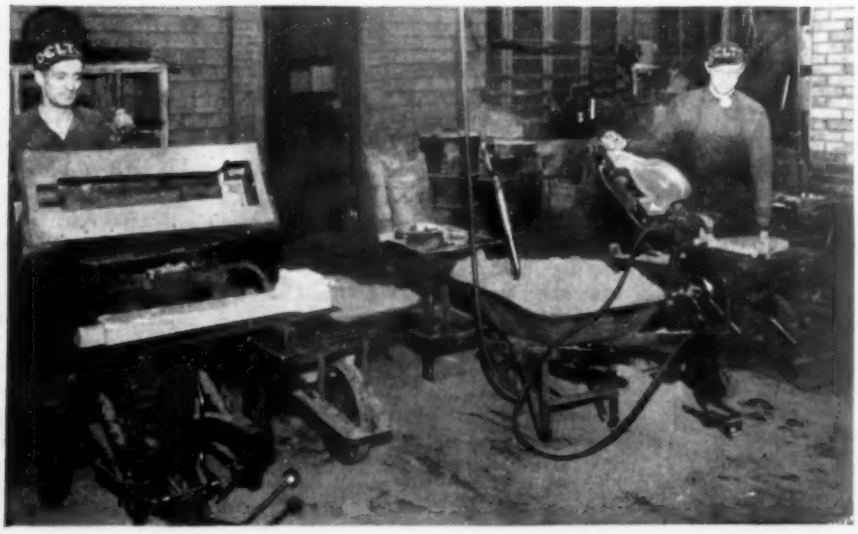
INTERNATIONALS

International Molding Machine Company **Chicago 8, Illinois**

If you have a foundry problem . . . call our Service Engineer
He knows the answers from practical foundry experience

Photographs taken at J. E. Gilson Company, Port Washington, Wisconsin





BUFFALO PARTY: Showing some of the 200 members and guests of the Western New York Chapter, AFA, who attended the group's spring dinner dance at the Buffalo Trap and Field Club. (Photos courtesy Jack Heysel, E. J. Woodison Co.)

(*Continued from page* 145)

that scientific inspection techniqu would become necessary adjuncts of sa programs after the war. Mr. Ball point cut that civilian customers, as judges postwar products, have become famili with military inspection procedures to degree that is sure to raise standards acceptance.

Outgoing president of the Southe California Chapter, W. D. Bailey J surrendered the gavel to Robert R. Hale new chief, and at the same time seate other new officers elected last month.

Mr. Bailey announced the forthcom ing summer stag party will be held Aug 4 at the Lakewood Country Club.— *Maurice Beam.*

Detroit

ANNUAL spring outing of the D troit Chapter, A.F.A., attracted proximately 425 members and guests the Forest Lake Country Club, Pontia Mich., on June 9. The afternoon w devoted to golf, cards and other gam of chance, followed by dinner, drawi for prizes, and a floor show. The ente tainment committee responsible for su cess of the affair was headed by Geor A. Fuller, Federal Foundry Supply C as chairman, and included the followin E. J. Burke, Hickman, Williams & C Inc.; Al Neeb, Eaton Mfg. Co.; Arth W. Stolzenburg, Aluminum Co. of Ame ica; William W. Bowring, Frederic Stevens Inc., and Arthur H. Allen, T FOUNDRY.—*Howard H. Wilder.*

Central New York

CENTRAL New York Chapter of th AFA had the largest turnout of t season at the annual business meetin held June 8 at the Ingersoll-Rand C Painted Post, N. Y. After various grou had toured the foundry and machi shops, they were directed to the co pany's recreation building, where cl facilities were made available. Go housekeeping conditions, particularly the pattern storage department of t plant, were remarked upon.

Approximately 150 members and gue assembled in the company clubhouse f dinner and the meeting which follow Chapter Chairman L. E. Hall introduc E. J. Smith, general manager of the co pany, who welcomed the foundrym and credited the success of the gather to the efforts of R. A. Minnear, found superintendent. John E. Halbing, a sistant general manager, gave a brief hi tory of the local plant.

N. H. Boardman, chairman of the nom inating committee, presented the follo ing slate of officers for the coming ye Chairman, E. G. White, Crouse-Hin Co., Syracuse; vice chairman, E. E. Hoo Dayton Oil Co., Dayton; secretary, R. Minnear, Ingersoll-Rand; treasurer, H. Hollenbeck, Kennedy Valve Co., E mira. Directors for 3-year terms includ N. Paul Benson, Frazer & Jones Co.; A

(*Continued on page* 150)

More and more iron, more and more steel, better and better irons and steels have gone into the construction of our vehicles of transport from the days of the "prairie schooner" until now. There was not much metal in the covered wagon. The age of iron and steel was yet to come.

In the development of better irons and steels, especially for the last twenty years, Molybdenum has been increasingly employed. Among the causes are advanced knowledge of alloying possibilities, higher efficiency in extraction and refining, more economical methods of using Molybdenum, and more demand for quality in construction materials of all kinds. Wartime urgency has quickened the advance. On the civilian front, restrictions that have held it back will soon be forgotten. Whoever wishes to be abreast of it in the next few years, will do well to make his plans now.

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Sales and Service in Principal Cities

(*Continued from page* 148)

thur Hintz, Rensselaer Valve Co. L. E. Hall, Syracuse Chilled Plow Co., retiring chairman, was elected director for 1 year.

Ben F. Shepard, chief metallurgist, Ingersoll-Rand, speaker of the evening, used as his subject, "Cast Iron—A New Engineering Material." He stated that foundrymen must sell to the design engineer the fact that cast iron is no longer a material of 20,000 psi, to be used only for sash weights, pipe, etc., but an engineering material of up to 50,000 psi that has many advantages over other metals in particular cases. At the beginning of the war effort, cast iron was relegated to the background in favor of steel, magnesium, aluminum and other nonferrous alloys. Industry later recognized the need for iron castings, and their importance, and production has steadily increased. Despite loss of skilled help to other types of foundries and the armed forces, today, cast iron production is at an all-time high.

Mr. Shepard demonstrated, with slides, that all cast irons are steels with carbon, and the strength of the metal depends on the size and distribution of the graphite flakes. Other factors in the successful production of high strength irons, he asserted, are rigid control and correct gating and risering.

A short film, "Flow of Metal as Influenced by Gating," produced in the Ingersoll-Rand laboratories, was shown at the close of the talk. This film was something radically different in foundry instruction. The procedure used, as explained by the speaker, was as follows: —A mold was made of refractory material with the recommended sprue and gates. The mold was cut in half and a transparent plastic plate bolted on in such a manner that the mold cavity, pouring basin, sprue and gates were visible. Molten metal then was poured into the mold and the metal flow in the sprue, gates and mold cavity was readily seen. Mr. Shepard claimed that air was trapped in the sprue and carried, by the metal, into the casting. When the film was slowed down, this was easily discernible. The film created such interest that it was shown the second time.—*John A. Feola, reporter.*

Twin City

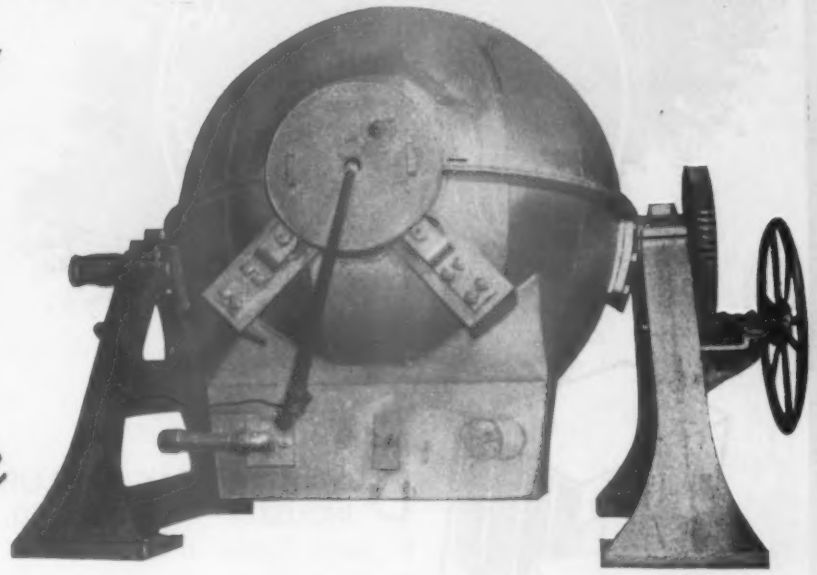
INDUSTRIAL Radiography" was discussed by A. F. Cota of A. O. Smith Corp., Milwaukee, at the annual meeting of the Twin City Chapter. Meeting at the Curtis Hotel on May 23, the group came formally under the chairmanship of R. C. Wood, Minneapolis Electric Steel Castings Co. The retiring chairman, A. M. Fulton, Northern Malleable Iron Co., thanked the members for their co-operation during the past year and cited Sheldon Pufahl, Paul Pufahl & Son, for his good work as chairman of the membership committee. Alexis Caswell, Manufacturers' Association, presented a financial report.

(*Continued on page* 152)

Announcing the

ROMPH ROTATING FURNACE

A Revolutionary NEW-TYPE MELTING FURNACE FOR *Aluminum*



Consider the Present and POST-WAR Advantage You Will Gain from these Known Accomplishments of the Romph Furnace:

This new development is the design of Mr. Paul Romph, a practical foundryman, and is now offered as a direct aid in meeting post-war competition.

EXTREMELY FINE-GRAINED METAL

Since the metal charge *at no time* comes in contact with a direct flame, a melt of extremely fine grain and superior quality is produced. Hydrogen absorption is practically eliminated. There are no "local" hot spots and iron pick-up is consequently less. Fluxing by gas or solid material is possible.

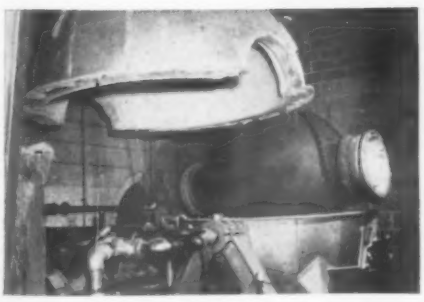
LOWER FUEL COSTS—FASTER MELTING

Note this typical aluminum heat: heel—300 lbs; ingot charge—2750 lbs; burner time—*136 minutes* (to 1400° F). Fuel consumption (gas)—2,924 cu. ft, or slightly over one *cu. ft. of gas per pound of metal.*

EASIER TO OPERATE AND MAINTAIN

In case of pot failure, the charge is not lost. Merely rotate pot to another position and continue melting. In one large production foundry, a run of 3 weeks additional was possible after the pot had been repaired.

FURTHER SPECIFICATIONS AVAILABLE IN FOLDER "F-1"



Melting pot may be changed in few minutes. No long cooling period required before changing.

Easy to charge. Even under maximum operation, the outer shell does not become hot.

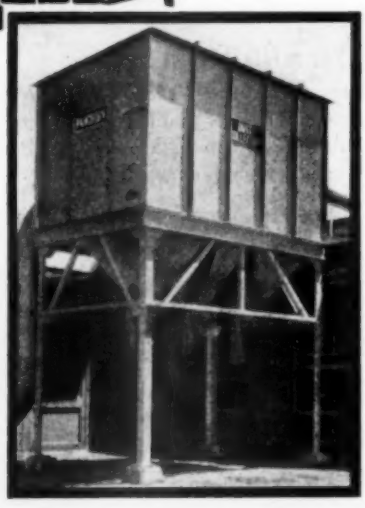
Charges may vary from 1000 to 3000 lbs. Large castings can be poured from one furnace melt.

ROMPH FURNACE COMPANY

7849 HARTWELL **DEARBORN, MICH.**

"PAY DIRT"

DUST IS THE "PAY DIRT" OF INDUSTRY—CONTROLLED, it pays large dividends; unchecked, it becomes a great destroyer. Whether it is the recovery of valuable dust or if it is the checking of its destructive action, DUST, when it is controlled, will save the manufacturer many times the cost of installing and operating an efficient dust collector.



SCATTERED THROUGHOUT THE WORLD, THOUSANDS OF **PANGBORN DUST COLLECTORS** stand as conclusive proof that **DUST CONTROL** is an economic necessity to all modern industrial plants.

Write to us, we'll be glad to advise you on your particular dust problem—there is no obligation.

PANGBORN

WORLD'S LARGEST MANUFACTURER OF DUST COLLECTING AND BLAST CLEANING EQUIPMENT

PANGBORN CORPORATION · HAGERSTOWN, MD.

(*Continued from page* 150)

The door prize was provided by Ross Coolidge of Koppers Coke Co., and was won by R. F. Boelter, American Hoist & Derrick Co.

Mr. Cota traced the growth of radiography from the discovery of X-rays in 1895 by Roentgen. Although some of Roentgen's earliest radiographs were of a gun, a key, a compass, and the lock of a door, X-rays were developed and applied primarily in the medical field. It is only in the past 15 years that much industrial use has been made of X-rays. Early work was done with medical equipment because no other was available. The major companies now produce special equipment particularly suited to industrial applications.

Mr. Cota explained the general principles involved in making and processing a radiograph and described the interpretation of films in considerable detail. Many illustrations were shown of casting and weld defects, as well as apparent defects due to carelessness and faulty darkroom technique. The necessity of using proper practice throughout all steps was emphasized. Mr. Cota was enthusiastic about the million volt equipment, which is particularly suitable for heavy sections because of speed and sensitivity.

Use Standard Test Films

In discussing control of processing solutions, it was explained that standard test films were used. Every thousandth film through the developer was a test film, each of which had been exposed under identical conditions. After processing, the film was examined for density and contrast to see whether bromide or refresher was needed in the developer.

Mr. Cota showed a number of slides illustrating radiographic technique in the laboratory, in the shop, and in the field. Illustrations of safety practices emphasized the need for proper protection of personnel from high voltage and from stray radiation. It was explained that operators had monthly blood tests and carried test films to indicate exposure to X-rays.

Due to competition with other methods of fabrication and the requirements of an increasing number of specifications, it will be necessary for more foundries to make use of radiographic inspection, Mr. Cota concluded.

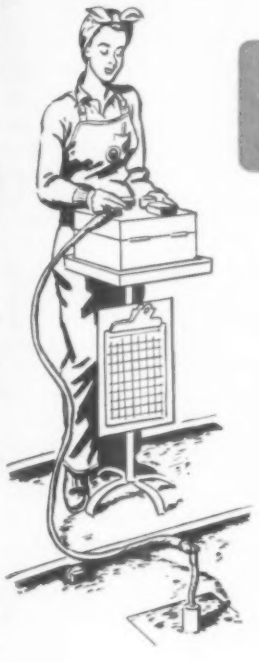
Chairman R. C. Wood, assisted by Howard Patton, vice-chairman, and Alexis Caswell, secretary-treasurer, are busy preparing for the 1945-46 season. Directors and officers have appointed members of the Program Committee, the Membership Committee and a n ew committee, the Publicity Committee.

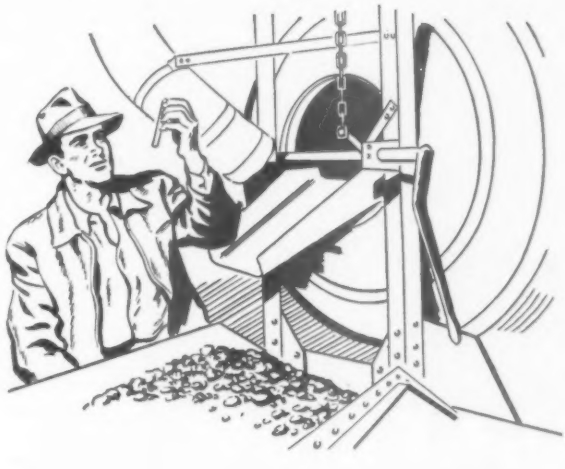
The Program Committee, which consists of I. F. Cheney, chairman, R. M. Aker, S. L. Cameron Jr., A. A. Gustafson, Herbert Larson and H. M. Patton, has the program well outlined and arrangements have been completed for most of the technical speakers. The program

(*Concluded on page* 154)

Number 10 of a Series: **"Looking at the 5 essential things you never see in electrodes!"**

Unforgettable EXPERIENCES!





ADDED TOGETHER, the working years of a faithful group of 369 National Carbon Company employees exceed 70 *centuries* of unforgettable experiences! *And unforgotten manufacturing experience* . . . with "National" carbon and "Acheson" graphite electrodes for electric furnaces. These loyal workers have been associated with us from 15 to 35 years each.

Now in its 60th year, National Carbon looks at the record of this group, and the many hundred others who have contributed so much to its history.

Some have improved plant machinery, or perfected its use. Others have developed formulas to yield stronger electrodes, or to give them lower electric resistance. Still others have helped customers use electrodes more effectively. A complete list of such achievements would be long indeed!

We truly believe that this unmatched manufacturing experience, extending over six decades, is of utmost importance to the quality of furnace electrodes . . . one of "the five essential things you never see" in them but which are basic to our products. The other "unseen" essentials are: Selection of raw materials, manufacturing control, customer service, and continuing research. Your inquiries are cordially invited.

NATIONAL CARBON COMPANY, INC.
Unit of Union Carbide and Carbon Corporation
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GENERAL OFFICES: 30 East 42nd Street, New York 17, N. Y.
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In Canada: Canadian National Carbon Company Limited, Toronto 4, Canada

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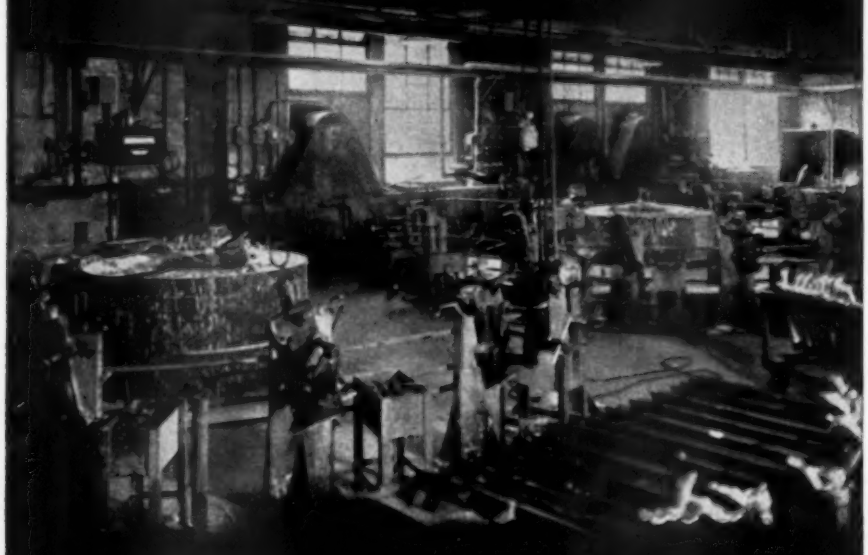
KEEP YOUR EYE ON THE INFANTRY . . . THE DOUGHBOY DOES IT!

HAUSFELD
FURNACES



MAGNESIUM
DIE-CASTING

Battery of
HAUSFELD
600 lb.
Magnesium
Furnaces in
Die Casting Plant

Photos courtesy of
ARMSTRONG CORK CO.
Lancaster, Pa.

The Campbell-Hausfeld Co.
300-320 MOORE ST. HARRISON, OHIO

(*Concluded from page 152*)

includes a number of general topics of interest to all types of foundrymen. An attempt will be made to increase audience participation in the technical discussions.

Sheldon Pufahl will retain chairmanship of the Membership Committee, assisted by Norman Wisner and Francis Marrin.

During the past years, the chapter reached a new high in membership, but fell slightly short of the goal set 12 months ago. Mr. Pufahl has consented to take the chairmanship again to make good his promise to double the membership.

The newly formed Publicity Committee, consisting of H. F. Scobie, chairman, A. W. Fulton, vice chairman, Clifford Anderson, Alexis Caswell, J. W. Costello, Axel Carlstrom, R. C. Garwood, M. E. Seaquist and Robert Sherman, was organized to provide pictures and stories of general interest to foundrymen and to promote the welfare of the foundry industry locally. By providing copy and photographs to newspapers, exhibits to schools, libraries, banks and large stores, by publicizing the importance and widespread use of castings, advertising labor-saving devices and safety precautions, it is expected that a greater awareness of the industry will be created in the general public. The favorable impression created should attract more and better craftsmen, increase the use of cast metals, and stir laggards of the industry.

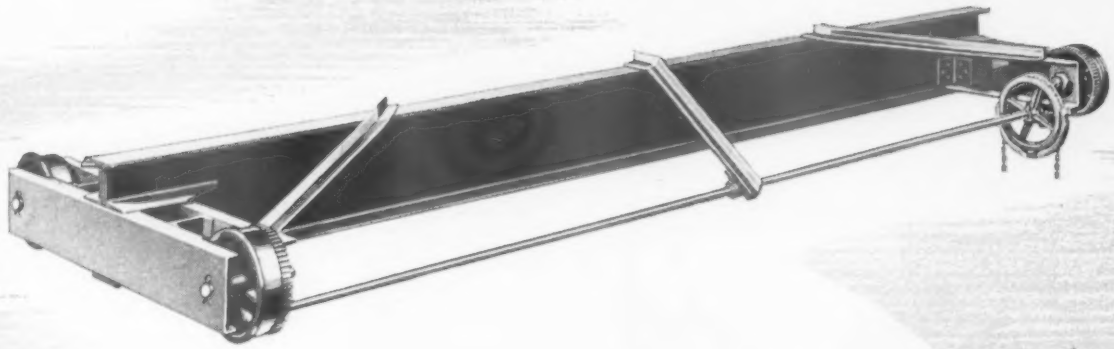
The committee is preparing a roster of chapter members and will publish a monthly news sheet. The news sheet will fill in the summer months during which no meetings are held and provide space for announcement of programs, personal history of technical speakers, and local foundry news.—*Herbert F. Scobie, publicity chairman.*

Cincinnati

SEVENTH annual stag party of the Cincinnati Chapter of the AFA was held June 13 at the Summit Hills Country Club, Fort Mitchell, Ky., with 255 members and guests in attendance. The only perfect day in several weeks brought out about 70 golfers, who missed the baseball game between the Wood Butchers and the Foundrymen. There is still some controversy as to who won the baseball game. War stamps were awarded as prizes to both winning and losing teams. Prizes were also awarded to golfers, based on their scores, and for darts, horseshoes and ping-pong. Reading the list of winners was like reading the entire membership list.

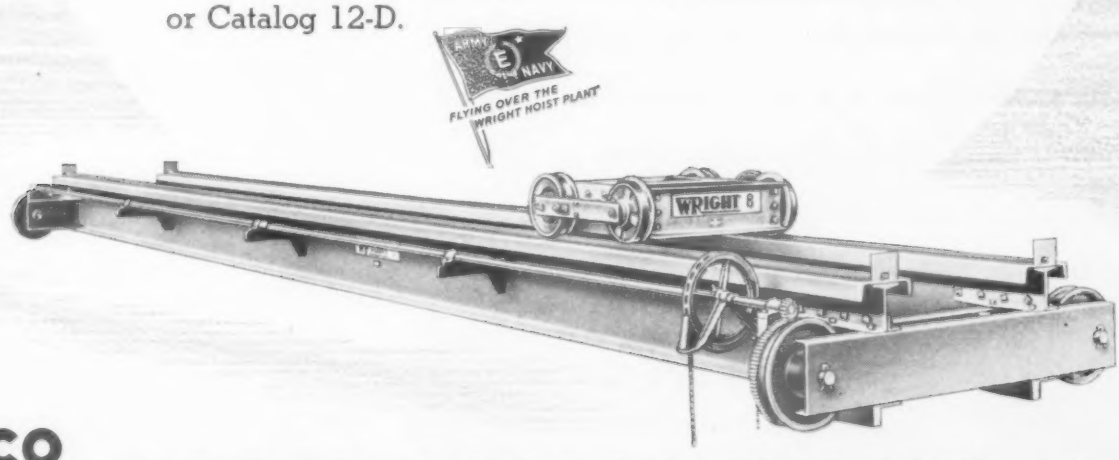
A fine chicken dinner was served in the dining room at 7:30 p.m. Chairman Rengering introduced the four new directors of the chapter, and after prizes had been distributed, the meeting was adjourned for cards. Next chapter meeting will be held in September.—*J. Schumacher, secretary.*

WRIGHT CRANES



THINK what an overhead traveling crane, with a **WRIGHT HOIST** and **TROLLEY**, could do—when it comes to moving machinery around, or in and out, in that reconversion job that is just ahead. A **WRIGHT TRAVELING CRANE** would really put your ceiling to work, and speed up not only reconversion but subsequent civilian goods production as well. The **WRIGHT** combination of crane and hoist would help bring your production costs down to competitive levels.

WRIGHT material handling equipment (cranes, hoists and trolleys) is built in any desired capacity and to meet the most exacting specification. If your problem is special, ask local **WRIGHT** distributor (see metropolitan classified telephone directory) to call in a **WRIGHT** engineer. In the meantime, write for **WRIGHT** Specification Bulletin, or Catalog 12-D.



ACCO

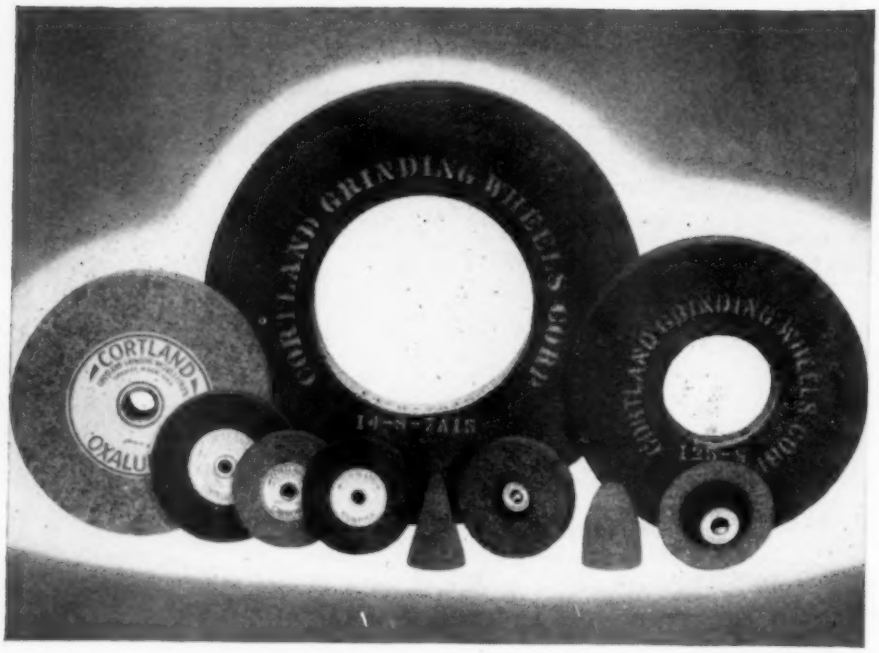
York, Pa., Chicago, Denver, Los Angeles, San Francisco, Portland, New York, Bridgeport, Conn.

WRIGHT MANUFACTURING DIVISION
AMERICAN CHAIN & CABLE

ACCO TRADE MARK

In Business for Your Safety

The Foundryman's Choice . . .



Cortland Snagging Wheels

It's a safe bet that Cortland has exactly the one you need, for the Cortland line includes Snagging Wheels in all sizes — all types. Mount them on floor stands or swing frames — or use them on portable grinders — you'll get rapid stock removal — longer wheel life — cooler grinding action on all types of castings, if you follow the recommendations of Cortland Engineers.

The Cortland policy is one of suiting the wheel to the job and its engineering and production facilities stand ready to work with you to that end.

Write freely about your problems to

CORTLAND GRINDING WHEELS CORP.

6 Cortland Street
Chester Mass.

For Better Snagging

CORTLAND

Wartime Expansion Of Foundries

(*Continued from page* 134)

Branford, Conn.; Olympic Steel Works, Seattle; Oregon Steel Foundry Co., Portland, Oreg.; Pacific Steel Casting Co., Berkeley, Calif.; Pelton Steel Casting Co., Milwaukee; Pettibone Mulliken Corp., Chicago; Reed Foundry & Machine Co., Kalamazoo, Mich.; Reliance Steel Casting Co., Pittsburgh;

Ross-Meehan Foundries, Chattanooga, Tenn.; St. Louis Steel Casting Co., St. Louis; Service Foundry Inc., New Orleans; Skagit Steel & Iron Works, Sedro Woolley, Wash.; Standard Stoker Co. Inc., Erie, Pa.; Sterling Steel Casting Co., East St. Louis, Ill.; Strong Steel Foundry Co., Buffalo; Superior Steel & Malleable Castings Co., Benton Harbor, Mich.; Swedish Crucible Steel Co., Detroit; Taylor-Wharton Iron & Steel Co., High Bridge, N. J.; Tennent Steel Casting Co., Seattle; Thys & Miller, Sacramento, Calif.; Treadwell Engineering Co., Easton, Pa.; Union Spring & Mfg. Co., New Kensington, Pa.; Utility Electric Steel Foundry, Los Angeles; Valley Steel Casting Co., Bay City, Mich.; Vulcan Steel Foundry Co., Oakland, Calif.

Washington Iron Works, Seattle; Western Alloyed Steel Casting Co., Minneapolis; Western Foundry, Chicago; Western Steel Casting Co., Seattle; Westlectric Casting Inc., East Los Angeles, Calif.; West Steel Casting Co., Cleveland.

GRAY IRON FOUNDRIES

Allyne-Ryan Foundry Co., Cleveland; Apex Steel Corp., Los Angeles; Aviation Corp., Williamsport, Pa.; Baker Perkins Inc., Saginaw, Mich.; Bardes, E. H., Range & Foundry Co., Cincinnati; Barnett Foundry & Machine Co., Irvington, N. J.; Black-Clawson (Rock Island Division), Hamilton, O.; Buckeye Foundry Co., Cincinnati; Buffalo Foundry & Machine Co., Buffalo; Campbell-Hausfeld Co., Harrison, O.; Carondelet Foundry Co., St. Louis; Caterpillar Tractor Co., Peoria, Ill.; Centrifugal Casting Co., Long Beach, Calif.; Colvin Foundry Co., Providence, R. I.; Consolidated Iron-Steel Mfg. Co., Cleveland; Crown Iron Works, Minneapolis; Cuyahoga Foundry Co., Cleveland.

Dayton Casting Co., Dayton, O.; Detroit Gray Iron Foundry Co., Detroit; Deuscher, H. P. Co., Hamilton, O.; Diamond Iron Works Inc., Minneapolis; Duplex Mfg. & Foundry Co. Inc., Elyria, O.; Durham Mfg. Corp., Ft. Wayne, Ind.; Elyria Foundry Division (Industrial Brownhoist Corp.), Elyria, O.; Erhart, Chris, Foundry & Machine Co., Cincinnati; Frank Foundries Corp., Moline, Ill.; General Foundry & Mfg. Co., Flint, Mich.; Golden Foundry Co., Columbus, Ind.; Greenlee Brothers & Co., Rockford, Ill.; Griffin Wheel Co., Chicago; Hamilton Foundry & Machine Co., Hamilton, O.; Lindgren Foundry Co., Batavia, Ill.; Love Brothers Inc., Aurora, Ill.; Lynchburg Foundry Co., Lynchburg, Va.

Macauley, H. C., Foundry Co., Berkeley,

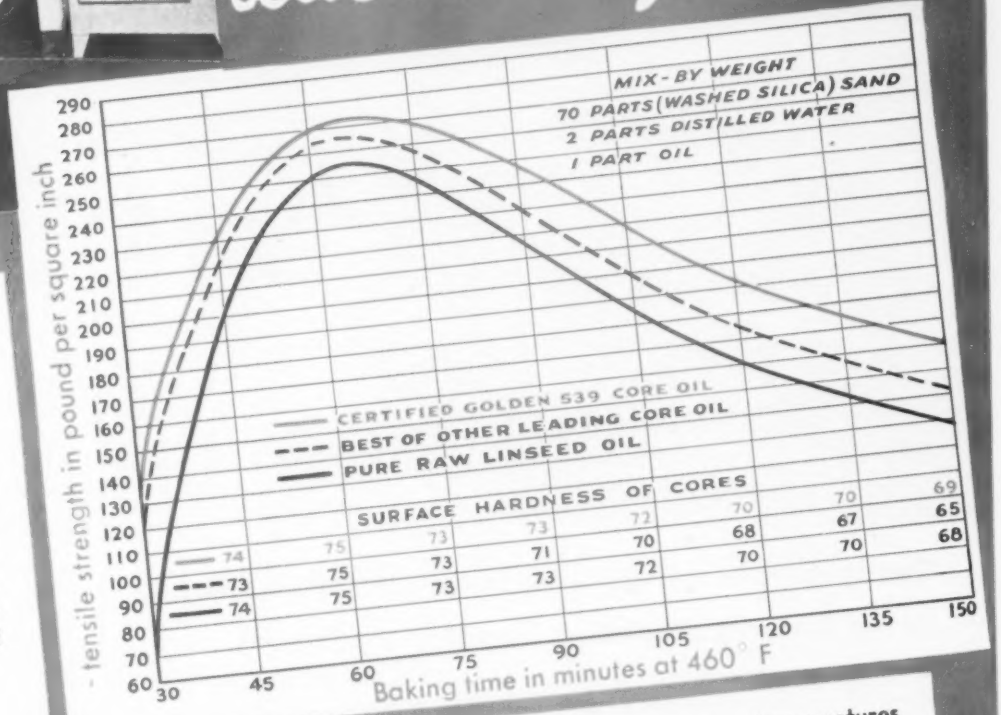
(*Concluded on page* 158)

Copies Available

The 192-page report of the Steel Division of the War Production Board on "Steel Expansion for War," from which the material in the accompanying article was taken, has been published in book form by the Penton Publishing Co., and is available through the Book Department, THE FOUNDRY, Penton Building, Cleveland 13, O., at a cost of $2 for single copies. Ten copies may be purchased for $1.80 each; 25 copies for $1.70 each; 50 copies for $1.60 each; 75 copies for $1.55 each; and 100 copies or over for $1.50 each.

CERTIFIED CORE OIL

Wins Tough Laboratory Test!


MIX - BY WEIGHT
70 PARTS (WASHED SILICA) SAND
2 PARTS DISTILLED WATER
1 PART OIL
CERTIFIED GOLDEN 539 CORE OIL
BEST OF OTHER LEADING CORE OIL
PURE RAW LINSEED OIL
tensile strength in pound per square inch
290 280 270 260 250 240 230 220 210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60
SURFACE HARDNESS OF CORES
74 75 73 73 72 70 70 69
73 75 73 71 70 68 67 65
74 75 73 73 72 70 70 68
30 45 60 75 90 105 120 135 150
Baking time in minutes at 460° F

The chart portrays the results of a comparative laboratory test of Certified Golden 539 Core Oil, the best competitive core oil, and pure raw linseed oil—and the results have been thoroughly substantiated by many of the largest and best known foundries that have used Golden 539 Core Oil for many years and who previously used only raw linseed oil to produce cores.

Our Dark Colored Unique 539 Core Oil and Rapidry 539X Core Oil also have the same maximum binding, and cost much less per gallon.

CERTIFIED GOLDEN CORE OILS—identified by their golden color; made of the most select raw materials. These are usually termed "conventional core oils" and are highest in price.

CERTIFIED UNIQUE CORE OILS—will give the same results as our Golden Core Oils, but being made from off-colored raw materials, they are dark in color and cost much less.

CERTIFIED RAPIDRY CORE OILS—are also dark in color and utilize what are known as polymers. They are lowest in price, will bake quicker in the oven or at lower oven temperatures and provide more readily collapsible cores.

All Certified Core Oils ever shipped have been on the distinct understanding that the quality must be as represented, run strictly uniform and give complete satisfaction—or be returned for full credit.

To obtain a trial order, tell us the grade and number of the core oil you use—its color, your type and mesh of sand, and your oven conditions. Without obligation, we will prescribe the proper grade for you.

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Stock and representatives: Buffalo, N. Y.; Elmira, N. Y.; Worcester, Mass.; Bloomfield, N. J.; Reading, Pa.; Sunbury, Ohio; St. Louis, Mo.; Milwaukee, Wisc.; Minneapolis, Minn.; Birmingham, Ala.; Houston, Tex.; Denver, Colo.; San Francisco, Calif.; Portland, Ore.

(*Concluded from page* 156)

Calif.; Mid-City Foundry Co., Milwaukee; Minster Machine Co., Minster, O.; Neenah Foundry Co., Neenah, Wis.; North End Foundry Co., West Allis, Wis.; Pacific Foundry Co. Ltd., San Francisco; Peerless Foundry Co., Cincinnati; Pohlman Foundry Co. Inc., Buffalo; Pufahl, Paul, & Son Foundry, Minneapolis; Reliance Foundry Co., Cincinnati; Rice Barton Corp., Worcester, Mass.; St. Marys Foundry Co., St. Marys, O.; Sidney Grain Machinery Co., Sidney, O.; Standard Foundry Co., Racine, Wis.; Standard Foundry Co., Worcester, Mass.; Stedman's Foundry & Machine Works Inc., Aurora, Ind.; Sterling Foundry Co., Wellington, O.

Tredegar Co., Richmond, Va.; Turner & Seymour Mfg. Co., Torrington, Conn.; Union Mfg. Co., New Britain, Conn.; Vermont Foundries Inc., Springfield, Vt.; Western Foundry Co., Portland, Oreg.; Windsor Foundry Corp., Windsor, Vt.; Zenith Foundry Co., West Allis, Wis.

MALLEABLE IRON FOUNDRIES

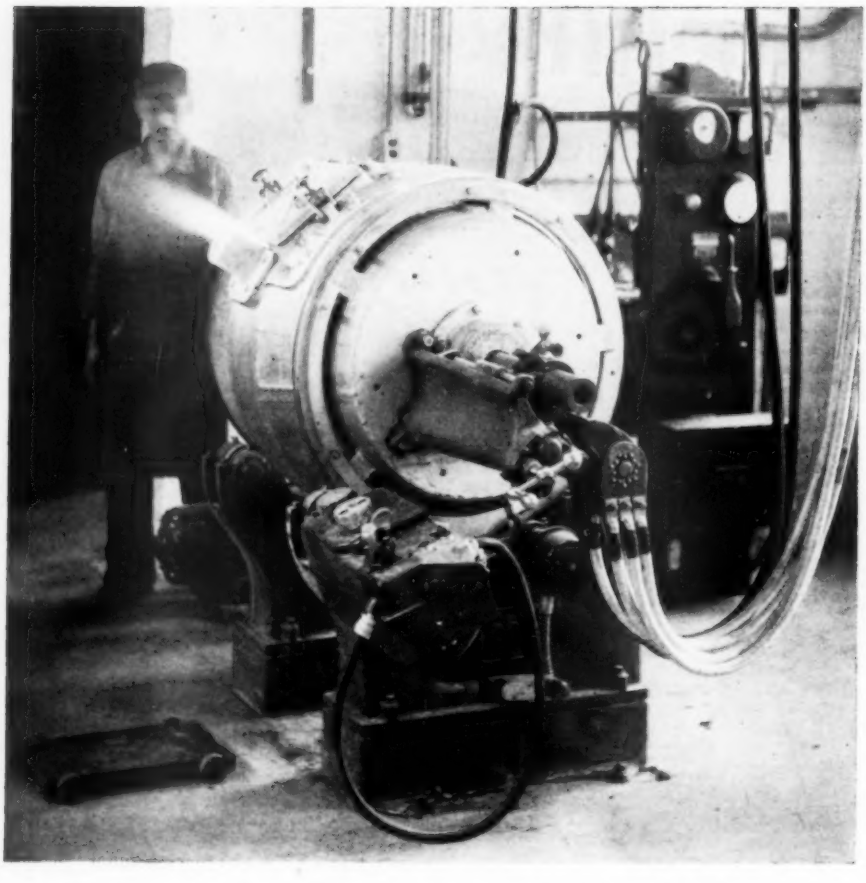
Albany Castings Co. Inc., Voorheesville, N. Y.; Belle City Malleable Iron Co., Racine, Wis.; Benton Harbor Malleable Industries Inc., Benton Harbor, Mich.; Cadillac Malleable Iron Co., Cadillac, Mich.; Chicago Malleable Castings Co., Chicago; Columbus Malleable Iron Co., Columbus, O.; Dalton Foundries Inc., Warsaw, Ind.; Dayton Malleable Iron Co., Dayton, O.; Deere & Co., Moline, Ill.; Federal Malleable Co., West Allis, Wis.; Frazer & Jones Co., Syracuse, N. Y.; Jamestown Malleable Iron Corp., Jamestown, N. Y.; Jewell Alloy & Malleable Co., Buffalo; Lakeside Malleable Castings Co., Racine, Wis.; Lancaster Malleable Castings Co., Lancaster, Pa.; Malleable Iron Range Co., Beaver Dam, Wis.; Marion Malleable Iron Works, Marion, Ind.; Meadville Malleable Iron Co., Meadville, Pa.; Meeker Foundry Co., Newark, N. J.; Michigan Malleable Iron Co., Detroit; Milwaukee Malleable & Gray Iron Works, Milwaukee; Northern Malleable Iron Co., St. Paul; Sacks Barlow Foundries Inc., Newark, N. J.; Webster Mfg., Tiffin, O.

British Ironfoundry Industry

(*Concluded from page* 89)

This question is linked to a large extent with the principles of quantity production and its corollary: mechanization, and also with the question of standardization of product. For various reasons it would seem that the scope for large scale rationalization of the ironfoundry industry in Great Britain is somewhat limited, but where conditions are favorable, it is generally recognized that rationalization would be a step in the right direction.

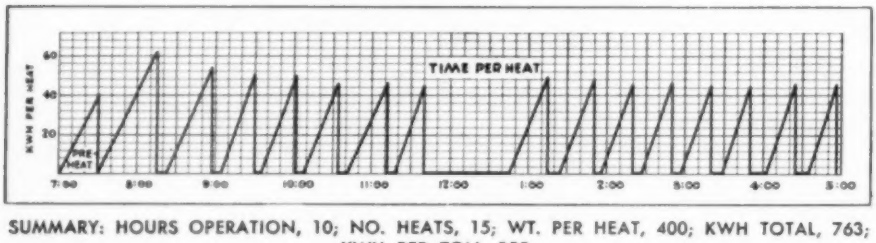
Taking the long view, it seems that the most difficult problem that the British ironfoundry industry will have to face in postwar years is the recruitment of young foundry workers and apprentices. Already a report embodying a complete scheme of education and workshop training of young foundrymen has been issued and widely circulated by the Institute of British Foundrymen. This report has been adopted and recommended to the industry by the Council of Ironfoundry Associations. In addition, the council, in collaboration with the Ministry of Education and the Ministry of Labour and National Service, is taking active steps to prepare the ground for the recruitment of apprentices by contacting schools, youths' organizations and local labour offices and emphasizing to them the opportunities offered to boys by the ironfoundry industry.



Typical operating record reveals efficiency of Detroit Rocking Electric Furnaces

The efficiency and economy of Detroit Rocking Electric Furnaces in the melting of non-ferrous metals is again proved by a recent daily operating record made in a large brass foundry. With only one man at the simplified controls, the type LFC 350 lb. Detroit furnace shown here produced 15 heats of 400 lbs. each in a 10-hour period. Charging and pouring time averaged 8 minutes per heat: melting time, 25½ minutes. Thus, a new heat was tapped every 33½ minutes, and the KWH consumption averaged only 255 per ton! (Note operating chart).

DAILY GRAPHIC OPERATING RECORD, TYPE LFC, 125 KW, 350 LB., DETROIT ELECTRIC FURNACE. MELTING 85-5-5-5 RED BRASS FOR SAND CASTINGS



SUMMARY: HOURS OPERATION, 10; NO. HEATS, 15; WT. PER HEAT, 400; KWH TOTAL, 763; KWH PER TON, 255.

Actual, on-the-job operating records like these are your surest proof that Detroit Rocking Electric Furnaces can save you money in labor and production costs, whether you melt ferrous or non-ferrous metals. These fast melting, versatile furnaces will effect further economies for you by permitting the use of salvage materials and by producing metal of consistently higher quality, thereby reducing the number of rejected castings. Available in 7 sizes from 10 to 8000 lb. capacity. Write for particulars.

DETROIT ELECTRIC FURNACE DIVISION
KUHLMAN ELECTRIC COMPANY • BAY CITY, MICHIGAN

Unlimited supplies of magnesium alloy ingots

Plus 29 years of Dow experience are now at your service

The materials you need to produce sound, easily machinable castings of magnesium are yours—*in full volume*—from the vast resources of The Dow Chemical Company.

First, of course, is the lightweight metal itself—available now in unlimited quantities. The complete Dow magnesium line includes pure magnesium metal, unique in its ability to eliminate needless weight . . . ingots of the many Dowmetal magnesium alloys, developed to meet precise property requirements . . . and a full selection of fluxes, protective agents and welding rod.

In addition, Dow offers still another ingredient essential to fine magnesium products: the technical service made possible through 29 years of experience in producing, alloying and fabricating magnesium. An expert staff is available for consultation with you. Call on Dow when your plans call for magnesium.

MAGNESIUM

THE METAL OF MOTION

MAGNESIUM DIVISION, THE DOW CHEMICAL COMPANY, MIDLAND, MICHIGAN

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Speedmullor

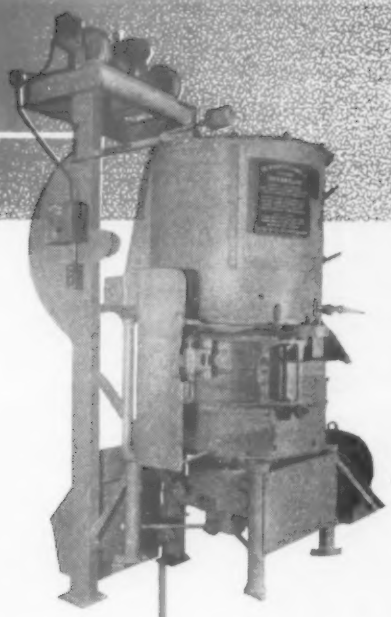
30-SECOND MULLING CYCLE SPEEDS VITAL CASTING PRODUCTION FOR GREDE FOUNDRIES, INC.

Fast... Efficient..

Thorough Mulling...
That's the Speedmullor!

This is properly mulled sand. Feel the difference... see the difference! The Speedmullor at Spring City Division prepares sand *just the way* they want it!

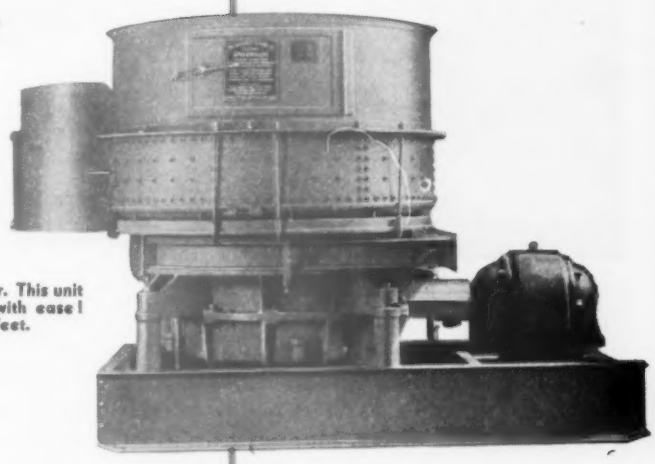
To help speed war-vital castings, Grede Foundries, Inc. (Spring City Division) needed a uniform thoroughly-mulled facing sand. A Model 30 Speedmullor was purchased to do this job... today this speedy mullor keeps three men busy carrying away load after load of perfectly mulled facing sand to the molding floor. The amazing Speedmullor kneads, squeezes, and aerates the sand to the exact specification required and does the entire job in less than one-half minute! For a clean, smooth surface finish on castings use the Speedmullor... it prepares the highest quality sand obtainable... it does the job faster... it reduces scrap losses and cleaning costs. Foundries everywhere report amazing savings in core oil because the Speedmullor's uniform mulling develops the greatest plastic strength and workability from the least amount of binder.



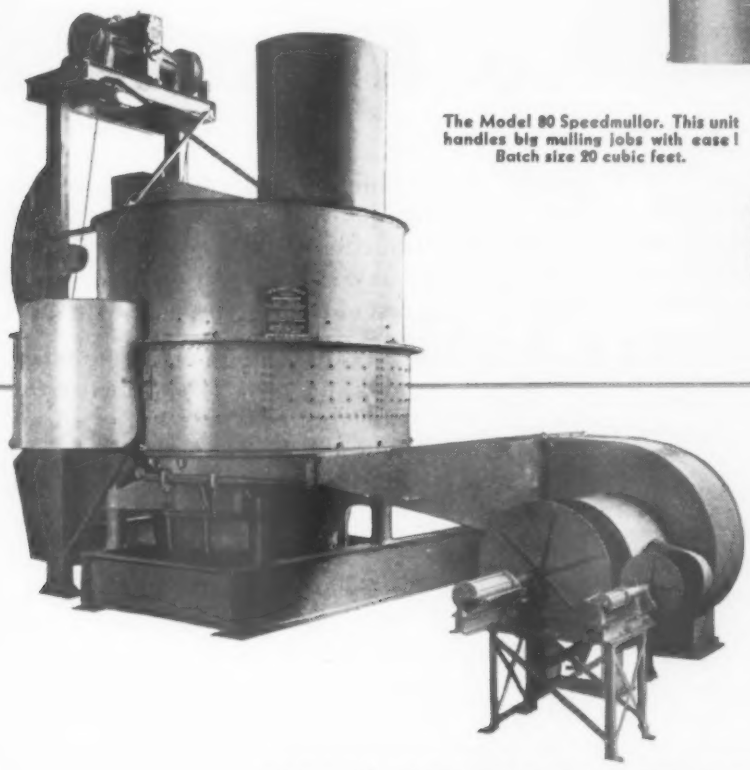
The Model 30 Speedmullor with skip-hoist. Popular with small and medium sized foundries. Batch size 3 cubic feet.

THERE IS A *Speedmullor* TO FIT EVERY FOUNDRY'S NEEDS!

Small, medium or large foundry . . . whatever your mulling problem—facing sand, backing sand or cores—for ferrous or non-ferrous castings—you'll have more thoroughly mulled sand faster with a Speedmullor. Can be furnished in a variety of sizes with or without skip-hoist; air cooling; fines removal. Also available for completely automatic operation; batch weighing, loading, mulling, cooling, and discharging.



The Model 80 Speedmullor. This unit handles big mulling jobs with ease! Batch size 20 cubic feet.



The Model 80 Speedmullor with air cooling. Meets the demands for large capacities in foundries, especially those with sand systems. Skip-hoist or bond hopper is available for new sand and additions if desired. Batch size 20 cubic feet.

WRITE FOR COMPLETE DETAILS

MANUFACTURER'S ASSOCIATION, INC. FOUNDRY EQUIPMENT

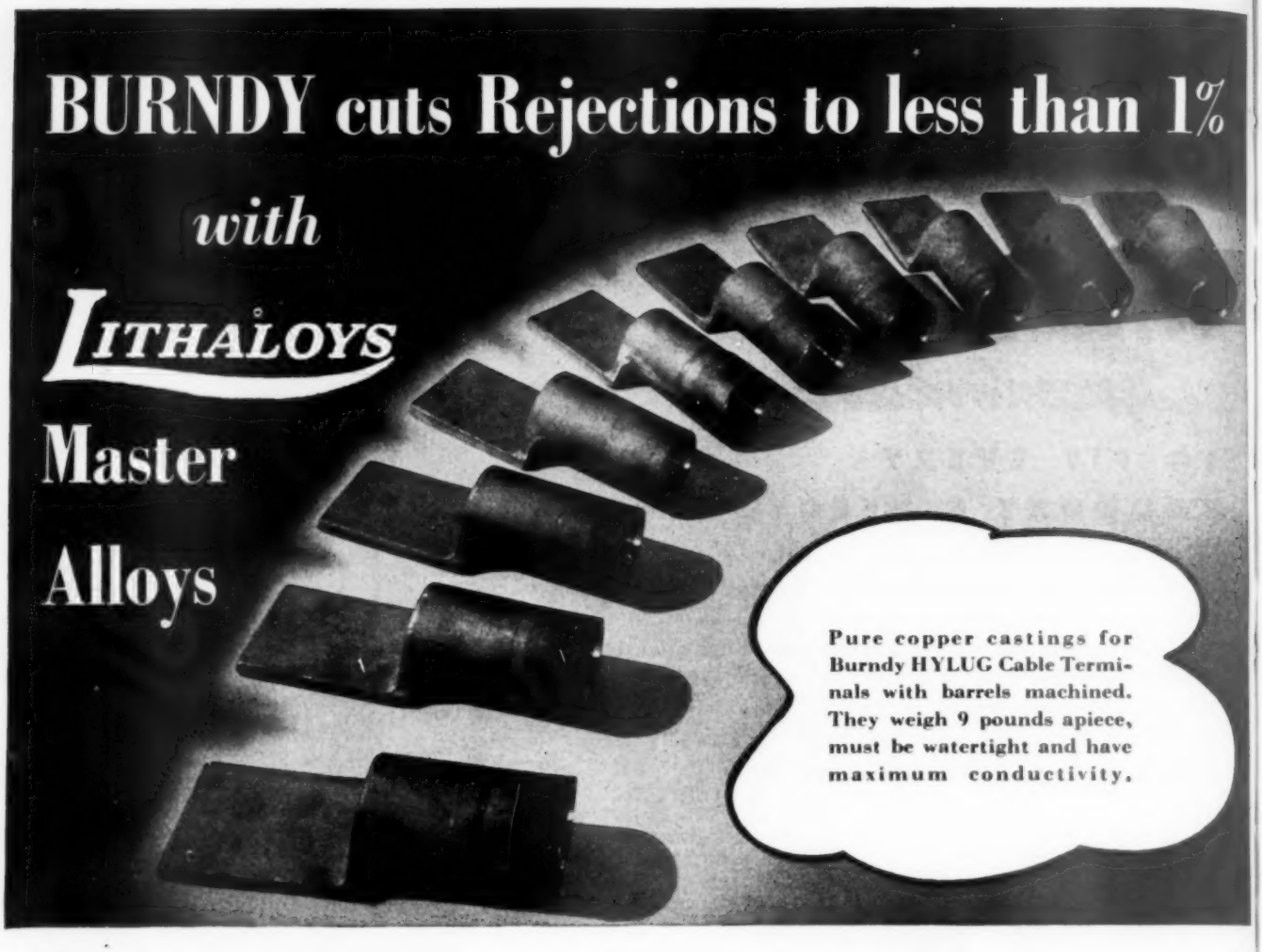
THE BEARDSLEY & PIPER COMPANY

2540 N. Keeler Avenue Chicago 39, Illinois

THE BEARDSLEY & PIPER COMPANY ARE MANUFACTURERS OF SANDSLINGERS, SPEEDSLINGERS, SPEEDMULLORS, SCREENARATORS, MULBAROS, SHAKE-OUTS, SAND CONDITIONING MACHINES, GYRATORY SCREENS

BURNDY cuts Rejections to less than 1%

with LITHALOYS Master Alloys



Pure copper castings for Burndy HYLUG Cable Terminals with barrels machined. They weigh 9 pounds apiece, must be watertight and have maximum conductivity.

Terminal lugs must stand up under severe operating conditions which means that the castings *must* be right to start with. Several years ago, Burndy engineers adopted Lithium treatment as a positive means of maintaining their well-known high standards.

Before Burndy used Lithium Master Alloy, their rejections, after machining, ran over 25% — mainly due to porosity. Today, not only have rejections been reduced to an average of *less than 1%*, but Burndy standards, at the same time, have actually been increased with respect to strength, density and conductivity.

This is not an isolated case. Many others, even though their materials need not meet such exacting inspection, have found Lithium treatment profitable. Melts of copper, tin bronze and silicon bronze, treated with Lithium, yield castings more uniformly free from porosity and gas cavities... with non-metallic impurities effectively removed... and with optimum physical properties... at a small fraction of the cost of *one* reject.

And this treatment calls for no special equipment, no special training, no departure from conventional foundry practice. Shortly before pouring, Lithium metal is simply stirred into the melt in the form of a stable master alloy containing a small percentage of Lithium combined with other metals to match the melt.

To assist you in investigating this money saving treatment, we offer the use of our own casting facilities and the services of our technical staff — without obligation. 11-LC-3

LITHALOYS CORPORATION

444 MADISON AVENUE, NEW YORK 22, N. Y.

NONFERROUS FOUNDRY PROGRESS

(*Continued from page* 93)

of the copper alloy side of the nonferrous casting industry is made up from a large number of small concerns situated all over the country, prevented any general scheme for large scale mechanizations being put into effect except in a few isolated cases where special plants were put down to meet urgent needs such as, for example, in the production of leaded bronze bearings. On the whole, however, the British founder has done his best to bring his equipment up to date in an endeavor to obtain maximum production with minimum labor. Particular attention has been devoted to melting furnaces, and the slower melting natural draft coke fired crucible furnaces have given place to forced draft and oil fired units. In a few odd cases electric furnaces have been installed of the Detroit rocking arc type. Greater use has been made of sand preparation equipment and molding machines, but not to the extent one would have anticipated. On the other hand it is worth while recording that there has been a marked increase in the use of centrifugal casting methods for such articles as liners, small diameter cored sticks, bushes, gear-blanks, etc. Considerable thought has been devoted to improved methods of mold and core drying, particularly from the point of view of fuel economy.

Adopt Improved Pouring Practice

Producers of chill cast bronze stick have materially improved the quality of their product by the adoption of controlled orifice pouring methods on the lines recommended by the Tin Research Institute[5]. Briefly speaking, it has been found that the most harmful forms of porosity can be eliminated and maximum tensile and rolling properties obtained by pouring with a single central stream at the minimum practicable rate into a vertical mold.

Developments on the light alloy side in connection with production matters have been phenomenal. This is no doubt due to the fact that casting activities in this direction are concentrated among a few large producers, free from preconceived ideas, making full use of the very latest equipment and technical control.

A great deal of research was sponsored during the war by the Ministry of Aircraft Production on the manufacture of precision castings, using a technique based on the lines of the lost wax process, with satisfactory results and considerable quantities of such castings made on a commercial basis.

Attention has also been directed to methods of improving the surface finish of high melting point alloys such as

8 Screenarators

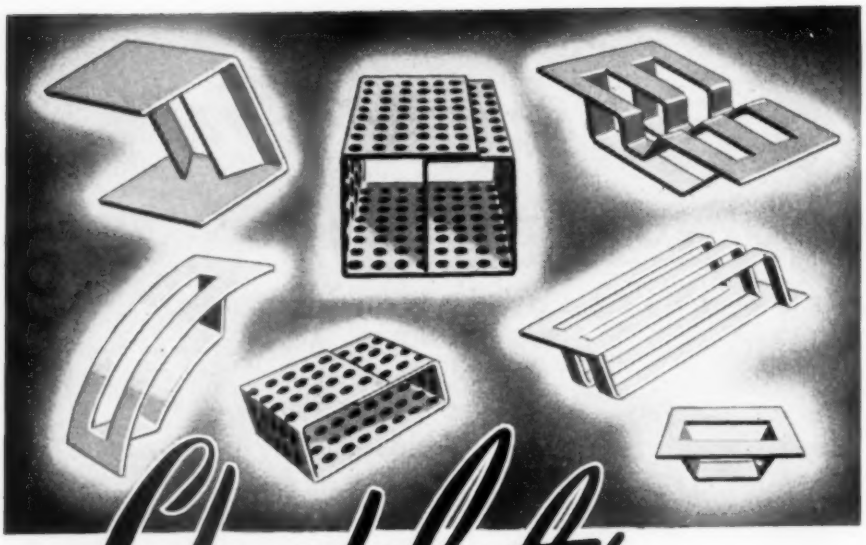
"DO WONDERFUL JOB"

FOR CHICAGO HARDWARE FOUNDRY CO.

● John H. Fienning, Superintendent of the Chicago Hardware Foundry Co., North Chicago, Ill. says: "Our eight Screenarators are doing a *wonderful job* in preparing our sands and are labor-saving at a very moderate up-keep."

● Dozens of job shops and production foundries all over the country tell us the same story . . . how thoroughly the Screenarator cleans, cuts, screens, double-aerates and blends sand . . . how this versatile, low cost sand conditioner produces more flowable, more rammable sand that assures smoother finished castings . . . how it saves both time and labor. See for yourself how the Screenarator conditions sand the *way* you want it, *where* you want it! Write for complete information today.

THE BEARDSLEY & PIPER COMPANY
2541 North Keeler Avenue Chicago 39, Illinois
Manufacturers of Speedslingers, Speedmullors, Sandslingers, Screenarators, Mulbaros, Shake-Outs, Sand Conditioning Machines



Chaplets AND Chills
BY MILWAUKEE

— are recognized throughout the foundry industry as dependable aids to higher and better production. Trifles in themselves, they have been constantly improved through the years . . . in both design and quality . . . to help the foundryman toward the production of castings which reach the highest possible degree of perfection.

Write for samples and prices of Milwaukee Thread Stem Chaplets . . . Standard Radius Chills . . . Schmitz Chaplets . . . Angle Chaplets . . . Patented Adjustable Radius Chills . . . Shells, Tubes . . . other types of Chaplets and Supplies.

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A 4831-2/3

nickel, Monel, etc., and this has been accomplished successfully by the use of suitable molding sands and protective washes. Excellent results have been obtained on castings made in green-sand molds by using a percentage of nonvolatile carbon such as mineral blacking or plumbago in the facing sand. In the case of dry sand castings it has been found that the mold wash is the critical factor, and best results are achieved by the use of a high grade, low ash content plumbago bonded with the smallest possible amount of china clay and dextrine.

General. Producers of high grade engineering castings in copper base alloys entered the war without any trade organization representative of the industry as a whole. This was found to be a great handicap in dealing with the various problems and emergency matters raised by ministerial and government departments, and it became necessary to form an Association of Bronze and Brass Founders which brought this section of the trade into line with the light alloy founders who already had a well established trade association. A very great deal of useful work has been done by both these bodies on many matters connected with the national effort. Fuel conservation, inspection methods for castings, questions dealing with costing and education, are just a few of the many problems taken in hand.

Introduces New Inspection Methods

Outcome of the investigations conducted into inspection methods for high duty copper base alloy castings required for fighting vehicles was particularly satisfactory as it bases the assessment of quality on the casting itself, according to the duty it has to perform, and fixes the function of separately cast test bars only as an index of the quality of the material employed for casting production. Inspection methods of this kind are quite new to makers of copper base alloy castings, although they are familiar enough to light alloy founders producing aircraft parts. They will, moreover, lead to an improvement in the quality of castings, to greater co-operation with the designer, and will familiarize the nonferrous founder to an increasing extent with all the latest aids to inspection methods, i.e., x-rays, crack detection apparatus, etc. Considerable work has also been done during the latter stages of the war regarding the possibility of developing a standard form of test bar suitable for all types of alloys and capable of giving a clearer indication of those factors, such as dissolved gas, which affect the quality of the material going into the casting.

Effect in the Postwar Period. So much for the developments in the nonferrous foundry during the war. What is going to be their effect in the postwar field? As stated at the beginning of this article, there have been no outstanding developments but those which have occurred are directly valuable to the trade as a whole. The industry has got together and lost

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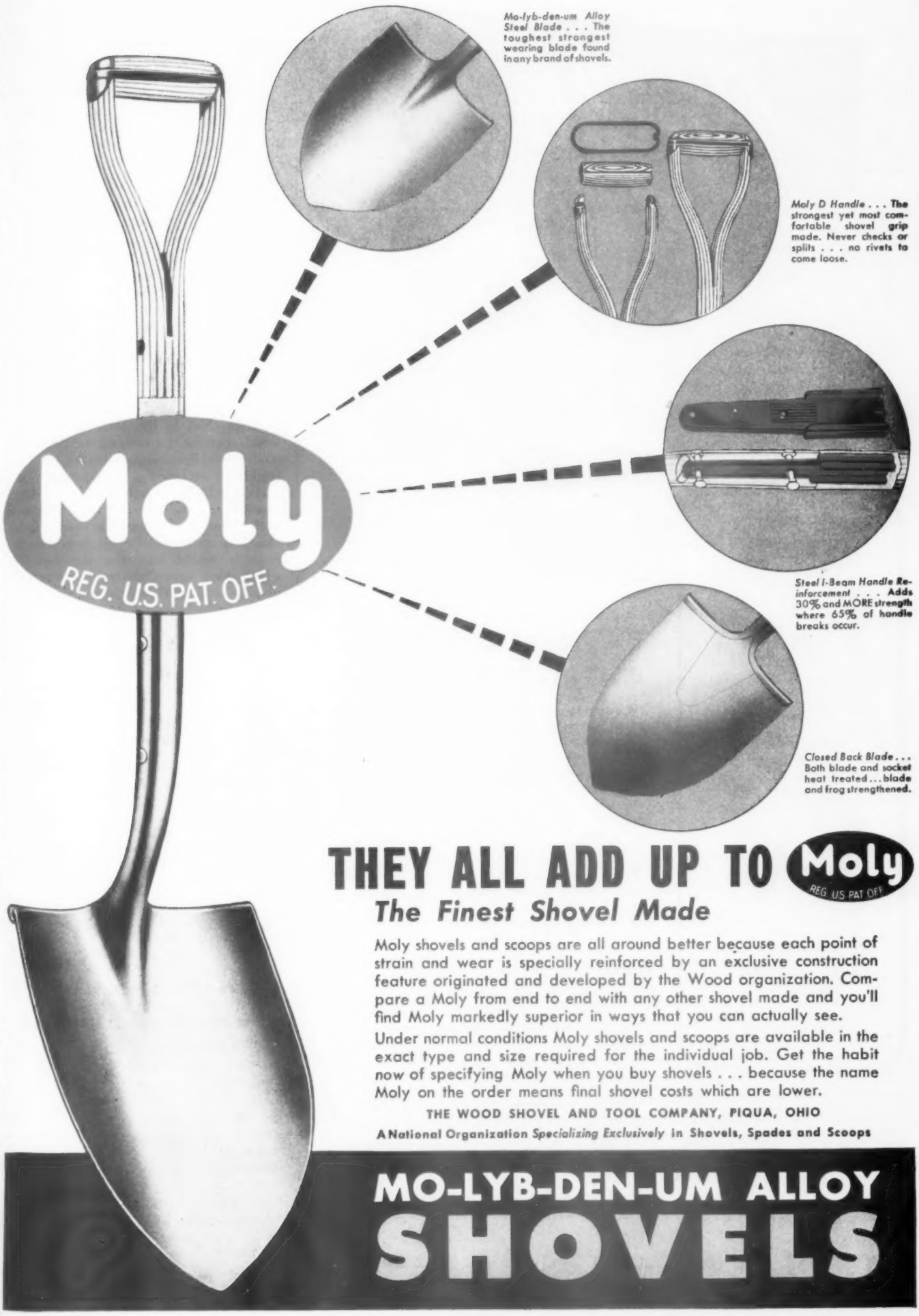
Mo-lyb-den-um Alloy Steel Blade . . . The toughest strongest wearing blade found in any brand of shovels.
Moly D Handle . . . The strongest yet most comfortable shovel grip made. Never checks or splits . . . no rivets to come loose.
Steel I-Beam Handle Reinforcement . . . Adds 30% and MORE strength where 65% of handle breaks occur.
Closed Back Blade . . . Both blade and socket heat treated . . . blade and frog strengthened.
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Moly shovels and scoops are all around better because each point of strain and wear is specially reinforced by an exclusive construction feature originated and developed by the Wood organization. Compare a Moly from end to end with any other shovel made and you'll find Moly markedly superior in ways that you can actually see.

Under normal conditions Moly shovels and scoops are available in the exact type and size required for the individual job. Get the habit now of specifying Moly when you buy shovels . . . because the name Moly on the order means final shovel costs which are lower.

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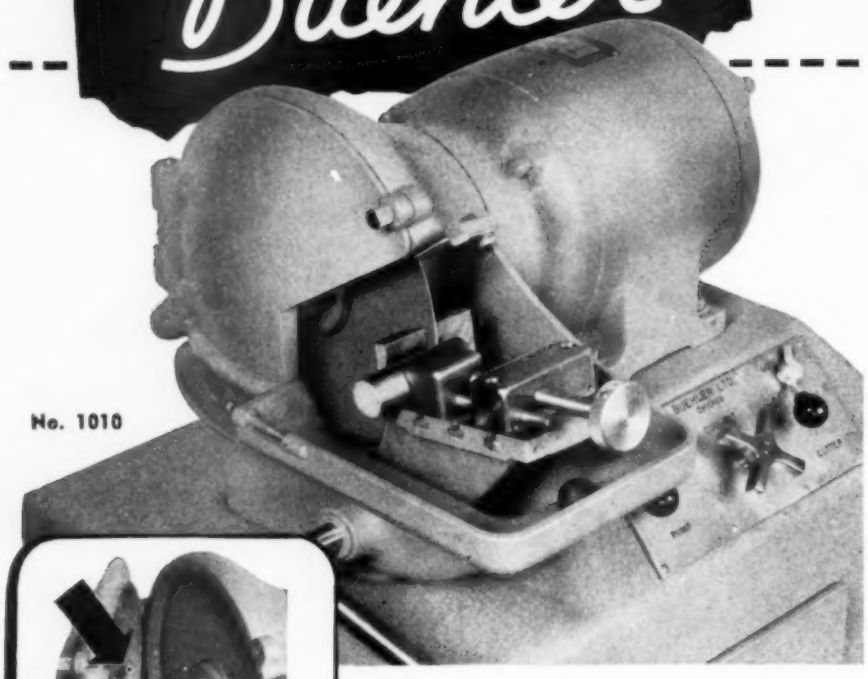
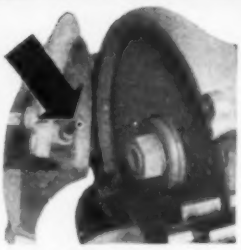
A National Organization *Specializing Exclusively* in Shovels, Spades and Scoops

MO-LYB-DEN-UM ALLOY SHOVELS

Buehler





Splash guard opened showing jet pipe for coolant; a companion jet is on the opposite side of the wheel.

Complete view of cabinet showing storage bin for extra wheels and tools.

New 1 H. P. CUT-OFF MACHINE

A laboratory size cutter with ample power for fast cutting of samples up to 1" in diameter.

This cut-off machine is built with the usual Buehler emphasis on precision in both the construction of the machine itself and the work it performs. The controls are arranged for the utmost convenience of the operator — a feature that contributes to speed and accuracy in cutting samples.

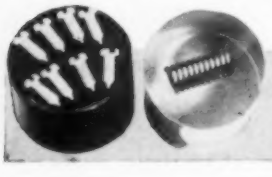
The cutting wheel mounted directly on the ball bearing motor shaft is free from side play or vibration and is cooled by a stream of coolant directed on both sides of the wheel under the guard.

The cutting is done on the front of the wheel by using the long lever handle to raise the clamp base holding the sample to contact the wheel. This mechanism is balanced so that pressure against the cutting wheel is under perfect control at all times by the operator. A metal splash guard, removed in the illustration, furnishes protection from spray.

Overall dimensions are 24" x 28" x 50". Shipping weight, 575 lbs.

The BUEHLER line of specimen preparation equipment includes — CUT-OFF MACHINES • SPECIMEN MOUNT PRESSES • POWER GRINDERS • EMERY PAPER GRINDERS • HAND GRINDERS • BELT SURFACERS • POLISHERS • POLISHING CLOTHS AND POLISHING ABRASIVES.

Buehler Ltd.
A PARTNERSHIP



METALLURGICAL APPARATUS
165 WEST WACKER DRIVE, CHICAGO 1, ILLINOIS

(*Concluded from page 64*)

much of its individual conservatism and prejudices. It has really started to get organized, and that is a very important point.

It is in a better position from the economic point of view. Founders all over the country have learned how to make the best use of raw materials in the foundry, such as fuel, scrap and secondary metals, and such knowledge is going to be of great postwar value.

The industry has become more efficient. The exigencies of war have eliminated a host of unnecessary specifications and focused attention on the need for international standardization of those which remain. Steps have been taken to ensure the closest possible cooperation with the designers and the users of castings. Above all there is a greater appreciation of the value of research, technical control and educational training. The British nonferrous founder is beginning to learn how to make a really good product in the form of a casting which can be guaranteed to do its intended job. Speaking generally, he is not frightfully interested in quantity and mass production methods, but he is in quality and is determined to make a better nonferrous casting than anyone else. In doing so lie his hopes in the postwar world and the developments which have arisen during the war may play no small part in bringing this about.

Bibliography

1. Hudson, F., "Use of Leaded Gun-Metal for the Production of Castings to Withstand Pressure," *Journal* Institute of Metals, 1944, vol. 70, pp. 407-422.

2. Baker, W. A. and Child, F. C., "Removal of Gases from Molten Bronzes," *Journal* Institute of Metals, 1944, vol. 70, pp. 349-370. Baker, W. A., Child, F. C. and Glaisher, W. H., "Effect of Shrinkage and Gas Porosity on the Pressure Tightness and Mechanical Properties of Bronze Sand Castings," *Journal* Institute of Metals, 1944, vol. 70, pp. 373-406.

3. Pell-Walpole, T., "Development of a Flux-Degassing Process for Chill-Cast Tin Bronzes," *Journal* Institute of Metals, 1944, vol. 70, pp. 127-147.

4. Hudson, F., "Some Notes on the Production of Aluminum Bronze Castings," *Foundry Trade Journal*, 1943, vol. 69, pp. 69-76, 80.

5. Pell-Walpole, T. and Kondic, V., "Effect of Some Variations in Casting Procedure on the Properties of Degassed Chill-Cast 10 Per Cent Tin Bronze," *Journal* Institute of Metals, 1944, vol. 70, pp. 275-289.

Foot Protection Is Subject of Manual

A 64-page manual offering facts and practical suggestions designed to aid safety directors in protecting the feet of their workers, has just been issued by the Hy-Test Division of International Shoe Co., St. Louis, manucturer of safety shoes. It includes such information as types of foot hazards and safety shoes; how to secure co-operation of management and workers in eliminating foot injuries; suggestions on operating a company safety shoe store, and recommendations on care of the feet and shoes. Entitled "Let's Use Our Heads and Save Our Feet," the book is available on request.

Do You Have Hard, Lumpy Sand At Your Shake-out?

¶ Sands with high dry strength give a slow, difficult shake-out . . . cause abuse of flasks . . . cause cracked castings . . . and create hard lumps at the shake-out which are difficult to recondition or re-temper.

DIXIE BOND

is the answer to this problem.

¶ Having a more *moderate* dry strength, it gives easy shake-out without lumps. And there is no danger of cracked castings. Get our well illustrated bulletin.

Remember, please, that ECP service engineers have *five* different bonding clays and their many combinations from which to give you the one right recommendation and to assure you of receiving the *most bonding strength per dollar.*

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All TYPES OF BONDING CLAYS

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Millions of whirling abrasive wheels, trained in war's tough school of precision finishing, each doing a prime job in laboratory, tool room, aboard ship, on production line. And —they're all set and eager to tackle civilian goods when peace machinery is singing again.

Whether it's removing burrs, smoothing edges, squaring surfaces so accurately that the finish can be measured in micro inches, or cut-off work—there's a Chicago ready to do a top-ranking job for you.

VITRIFIED GRINDING WHEELS with a 50-year pedigree. Up to 3" in diameter in various abrasives and bonds including the famous FV Bond.

MOUNTED WHEELS. The largest assortment made with a shape and abrasive to take care of every internal and external finishing job.

CUT-OFF WHEELS. All types and sizes. Now offered with the sensational new special-formula RT Bond (rubber or resinoid).

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Name _____

Address _____

MECHANIZING SMALL JOBBING FOUNDRY

(*Continued from page* 110)

the storage bins. Pig iron, scrap and limestone are pulled into the bucket in proper amounts. Coke is run in on top of the metal from an enclosed bin equipped with a slide gate. Completed charge is run over the skip hoist charging bucket and dumped into the top at floor level. The skip hoist then delivers the charge to the cupola. Scale bucket is of 1500-pound capacity metal charge plus 200 pounds of coke.

Five coke fired blower type furnaces are used for melting bronze and aluminum. Two are 24-in. and three are 18-in. size units. Two 24-in. vertical centrifugal casting machines are available in the nonferrous melting department. A 300-lb capacity crucible type 100-kw electric induction furnace is included in the melting department to handle all special alloy metals where exacting and uniform physical properties are specified. The writer believes that the higher standards of uniform castings will necessitate the installation of some type of batch melting unit by up-to-date and progressive foundries. The trend during the past few years has shown that the melting medium has an important bearing on the production of uniformly controlled metal, especially in high alloy irons. Induction lift coil type units are particularly well adapted for the smaller jobbing foundry where only small tonnages of different alloy irons are needed. Separate crucibles can be used for each type of metal, thereby eliminating the chance for a pick up of any undesirable alloys.

Castings Moved in Trucks

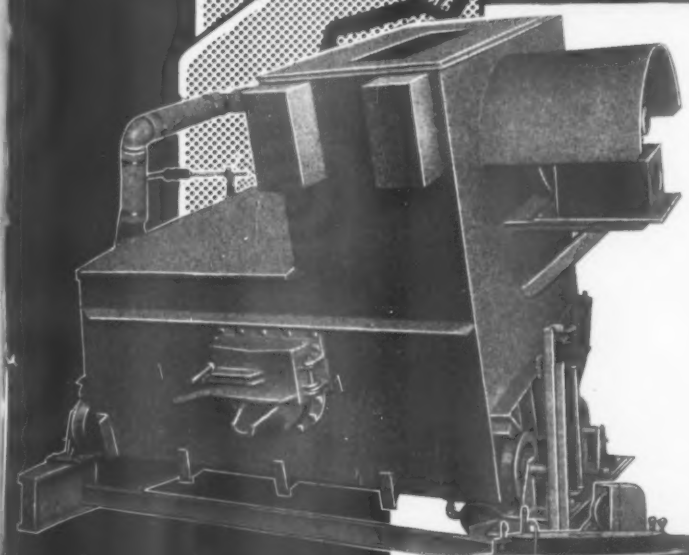
The grinding department has one 24-in. double end variable grinding machine, two 18-in. double end, and one 12-in. extended shaft machine; also the usual assortment of miscellaneous air grinders and chippers. Castings from the cleaning department remain in the same trucks, while castings are moved from grinders to inspectors. Empty trucks then are returned to cleaning room for reloading.

The foundry building, 72 x 257 ft, presenting a floor area of 18,504 sq ft, is adapted for straight-line production. Core room and pattern storage are at one end. Molding and melting departments are in the center. Grinding, inspecting and shipping departments are at the opposite end. At no point is there any back tracking of materials except for gates, sprues and defective castings returned for remelting.

Unique feature of the layout is the complete separation of departments, also the method of ventilation and general building construction. Note particularly that the molding department is

(*Concluded on page* 172)

3 Efficiency Plus MELTING FURNACES



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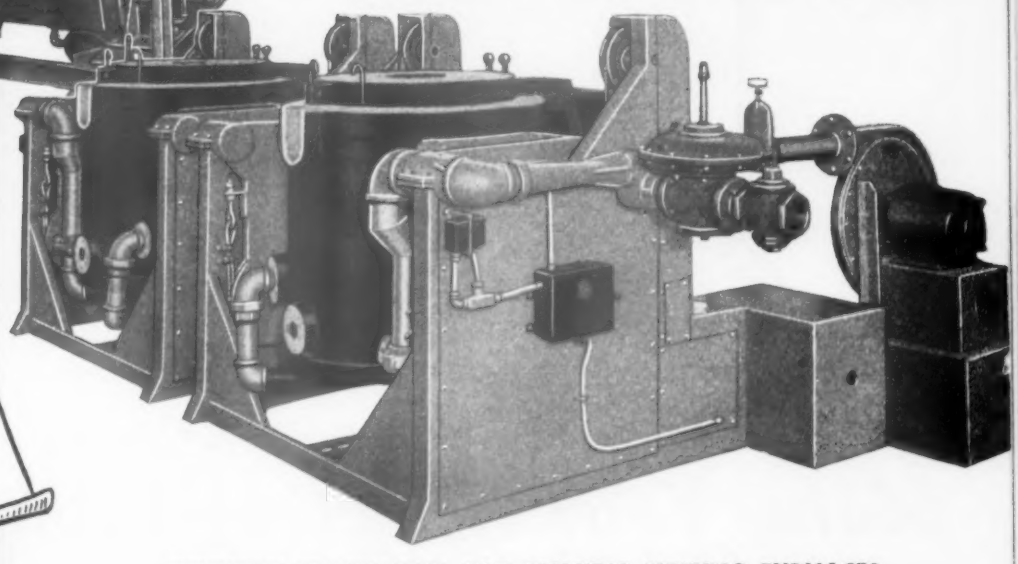
For melting Brass, Copper, Aluminum, Ferro-Manganese and special cast iron alloys.

In this great furnace that has won acclaim throughout the British Empire, metal is charged into a hopper which is also an exhaust from combustion chamber. Here the metal is preheated and melted at the throat of the hopper. The cold metal does not reach the molten bath. Charging is continuous and it is not necessary to shut off the flame to charge additional metal. These features make for fast melting and greatest fuel economy, as combustion chamber is heated by the same fuel that is used to melt the metal in the throat of the hopper. It is exceptionally cool for the operator to work around. Tilting mechanism may be either mechanical or hand tilt according to the size of the furnace. It may be fired by Oil or Gas, and capacities range from 350 to 10,000 pounds of Brass.

Bulletin No. 501 gives complete information, send for it at once.



REMEMBER . . . Stroman makes furnaces of all types and all sizes for the melting of Brass, Aluminum, Magnesium and all other types of non-ferrous metals. Their engineers will gladly consult with you on any or all your melting room problems.

STROMAN MECHANICAL TILT CRUCIBLE MELTING FURNACES

For Brass, Bronze, Aluminum and other non-ferrous metals. Combining such outstanding and exclusive features as Stationary Lip Pour, which eliminates the necessity of shifting the ladle at any time during the entire pour . . . Finger-Tip Tilt Control . . . Many improved safety features . . . Push-Back Cover . . . Utmost fuel economy with either oil or gas fire . . . these furnaces will handle your melting jobs faster, better, and at great savings in costs. Capacities from No. 60 to No. 400 Crucible sizes. Bulletin No. 44 gives complete information.

STROMAN STATIONARY CRUCIBLE MELTING FURNACES

For Brass, Bronze, Aluminum and other alloys.

These furnaces sturdy, streamlined design and construction assure longest life, fastest and most efficient melting and greatest fuel economy. They are available with choice of three types of covers . . . Push-Back, Counter-Balanced and Swing (illustrated). They may be fired by Oil or Gas and are built to handle capacities ranging from No. 20 to No. 400 Crucible. Send for Bulletin No. 52 for complete information.

STROMAN FURNACE & ENGINEERING CO.

DIVISION OF

THE PETERSEN OVEN CO. 300 W. ADAMS ST. CHICAGO 6

The 12"-39" Adams Jolt Squeezer, Portable Type

Make Your Selection From This List

SIDE ROD TYPE PORTABLE OR STATIONARY	Squeeze Piston diameter	Jolt Piston diameter	Clearance between Side Rods	Pattern Draw, Adjustable
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10"-32" Universal Jolt Squeezer	10"	4"	32"	3" to 6"
12"-38" Universal Jolt Squeezer	12"	5"	38"	3" to 6"

Also Adams Hand Squeezers — 30", 34" or 38" between side rods — Portable or Stationary.

THE ADAMS COMPN

MOLDING MACHINES · FLASK

The 10" Post Type Universal Squeezer, Portable Type

Adams Molding Machines

POST TYPE PORTABLE OR STATIONARY	Squeeze Piston diameter	Jolt Piston diameter	Pattern Draw, Adjustable
10" Post Type Jolt Squeezer	10"	4"	
12" Post Type Jolt Squeezer	12"	5"	
10" Post Type Universal Jolt Squeezer	10"	4"	3" to 6"
12" Post Type Universal Jolt Squeezer	12"	5"	3" to 6"

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The Shepard Niles Single-Speed Push-Button Controller is especially useful for small hoists and trolleys operating at slow speed where delicate handling of the load is not required.

Save manpower, operating cost, speed production with the equipment of tomorrow. Shepard Niles engineers are available in all war-production centers.

Shepard Niles
CRANE & HOIST CORPORATION

360 SCHUYLER AVE. • MONTOUR FALLS, N. Y.

(*Concluded from page* 168)

completely separated from the other departments except for openings in the wall to allow for the passage of molds on the conveyor lines. These openings are covered with flexible sheeting. Five 10-ft openings in the wall back of the crucible furnaces eliminate most of the gas and smoke. These openings are equipped with steel roll-type doors which can be closed when necessary.

Building features include monitor type roof, 20-ft high side walls, 32 ft under the peak and 40 ft from floor line to monitor peak. An additional 10 ft of head room is arranged over the bucket elevator. One 11 x 12-in. single stage compressor supplies all the air necessary for operating molding machines, core blowers, sandblast room and air tools.

Ventilation is confined to those items of equipment which produce dust and fumes—shakeout, sand mixers, blast cleaning, grinders and furnaces. A 30,000-cfm, wet type dust collector takes care of the situation and discharges waste material directly to any low points on the property, or into sludge hoppers for removal by truck.

The building is designed around the equipment instead of the general practice of putting up a building and setting up the equipment later. This method often defeats the entire project in not allowing sufficient room at points where it is needed.

Glass blocks take the place of the conventional single thickness glass window. Ventilation is through openings under each glass section with louvers which can be adjusted as necessary. This arrangement in connection with separate enclosed rooms for each department plus ample ceiling clearance insures adequate ventilation and well lighted and comfortable working conditions. Design and layout makes for good housekeeping, generally so hard to maintain in a foundry.

Other items of mechanical equipment can be utilized to advantage. These can be considered and incorporated later in the layout if it is felt they will offer improvement. Permanent equipment should be kept away from the wall at the core room end. This wall then may be extended at any time without interference with installed equipment or production. Any extension to this end of the building will still maintain a suitable distance from the cupola which, it will be noted, has been placed somewhat over the center of the building for this purpose.

Appoints West Coast Distributor

Keller Tool Co., Grand Haven, Mich., has appointed Dawson Machinery Co., 2737 First Ave., Seattle, as distributor of its tools in that territory. The line includes pneumatic die grinders, drills, scalers and chipping hammers, ratchet wrenches, filing machines, and air motors, for standard or special purposes.

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Choose VELSICOL Coresin Oil

These sturdy core oils are odds-on favorites in foundries where tough assignments are the rule. They perform like the thorobreds they are whether the going is light or heavy. That's why your foundry comes out ahead when you use Velsicol CORESIN Oil.

Our core oil service is available for your benefit without obligation. Write or call for samples and complete information, specifying metal poured and other pertinent data.

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VELSICOL

The Foundries Materials Company, Coldwater and Detroit, Michigan and Hammond, Indiana; Midwest Foundry Supply Company, Edwardsville, Illinois; H. S. Stoller & Company, Akron, Ohio.

Installation of a Model "AM" Sandcutter at the Dalton Foundries, Inc., Warsaw, Indiana, has released 13 men from laborious sandcutting operations. Sixteen men had previously toiled with shovels in cutting 64 floors every night.

Now, with one operator for the Sandcutter and only two men for the trimming operations, all sandcutting is finished in less than eight hours. When the molders report for work in the morning they find the sand in excellent condition for molding.

This example is not unusual, nor is it even too remarkable for a Sandcutter—hundreds of other installations show records of even greater performance.

If you feel that your sand-conditioning job can stand improvement, investigate the ever-popular Sandcutter. More than 2000 have been installed in foundries everywhere.

Sandcutters are supplied in 4 models for light to heavy floors, and in 12 sizes with cutting cylinders ranging in length from 45" to 82". Write for literature today.

American Sandcutter
FOUNDRY EQUIPMENT CO.
505 S. BYRKIT STREET, MISHAWAKA, INDIANA

IBF HOLDS ANNUAL MEETING

(*Continued from page* 108)

W. C. Devereux, managing director, High Duty Alloys Ltd., Slough, who dealt with "The Future of the Light Metal Foundry Industry." This lecture was universally acclaimed as of outstanding merit.

In proposing a vote of thanks, A. Logan mentioned that Col. Devereux, long before the war, had been in close contact with affairs in Europe and had seen clearly the result of Nazi policy. His warnings had been scarcely heeded, but he had proceeded to build up an outstanding organization, the existence of which, at the outbreak of war, had been a great national asset. Col. Devereux had been a pioneer in the phenomenal growth of light alloy founding in the last 10 years and he combined a realistic outlook with vision and imagination. Responding to the vote of thanks, Col. Devereux said that the only way in which Britain could live was by its ability to fabricate and to sell. He believed the whole essense of being in business was to create a better life.

An informal luncheon was held before the afternoon session, at which 260 members from all parts of the country were present.

Technical papers were presented and discussed in four sessions, one in the evening of June 15 and three in the afternoon of June 16.

Discuss Hydraulic Cleaning

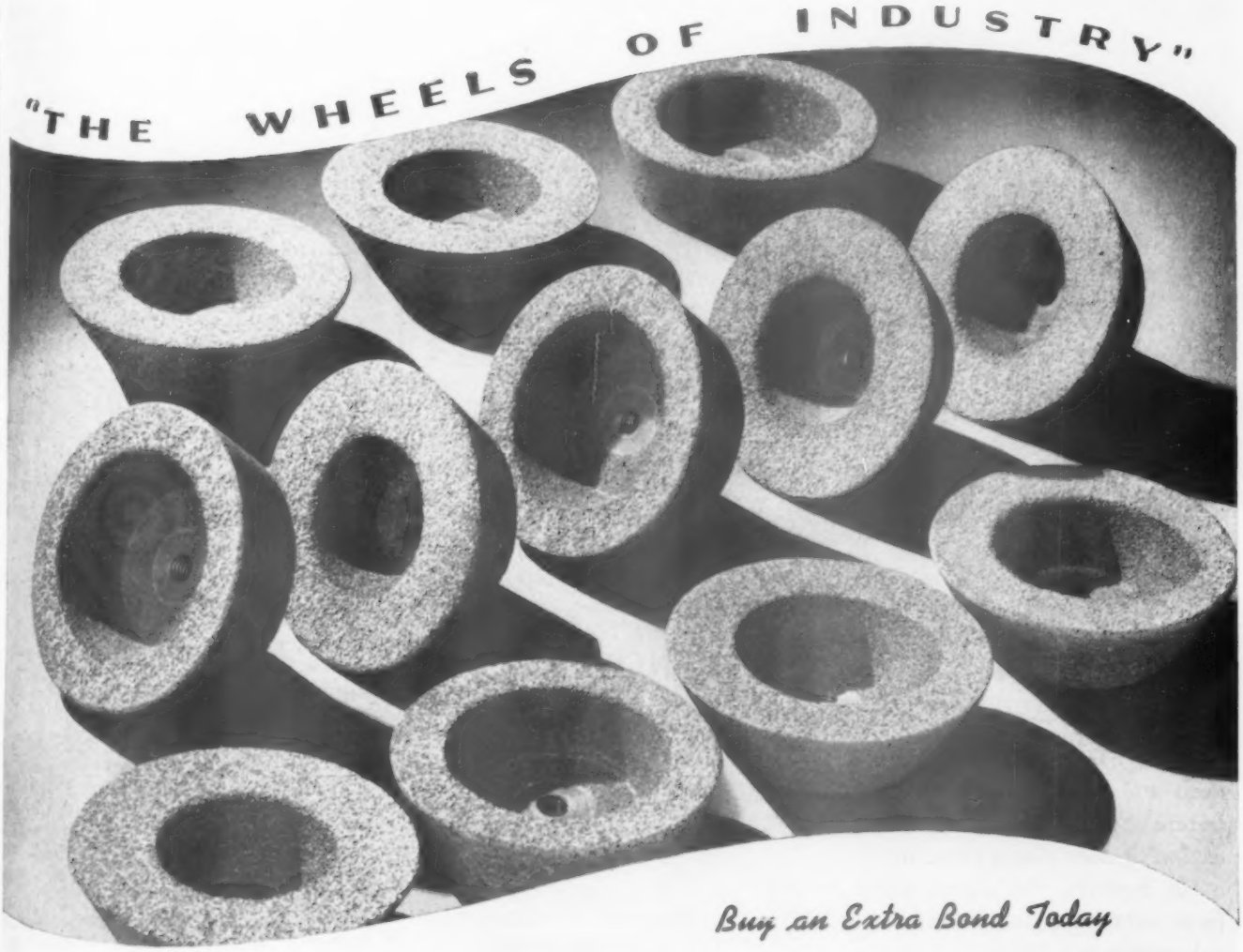
The first paper presented at the evening session was: "Initial Experience in Hydraulic Cleaning in a Steel Foundry Fettling Shop," by F. N. Lloyd, managing director, F. H. Lloyd & Co. Ltd., Wednesbury, in which the author described a hydroblast plant installed in a fettling shop, explained the operation of the plant, discussed the results from the point of view of sand reclamation and gave some data concerning operating cost.

In the discussion, C. H. Kain, emphasized the manner in which cores were lifted by the wet stream of sand, and he also stressed the fact that by this process castings could be cleaned from the foundry hot, a fact of particular interest to steel founders who had to face up to descaling. R. Bales mentioned that wet cleaning was used in England in 1913 at a pressure of about 220 lb. He also inquired about the effect on operators in regard to colds, pneumonia, etc.

A. Tipper described tests made by his company on the use of reclaimed sand for cores in connection with the manufacture of aero engines. Practical tests in the foundry showed that reclaimed sand mixtures worked satisfactorily but dried faster than new sand. Mixtures of equal proportions of reclaimed and new sand could be used for general core-making without increased addition of core binder; recovered sand cores were

(*Continued on page* 176)

Accurately Proportioned and Carefully Engineered To Do Difficult Grinding Jobs Faster and Better!



• Sterling's "Wheels of Industry" are available in all sizes and shapes . . . all proper grain combinations . . . every correct bond and structure . . . to help you do better grinding jobs faster. Sixty years of experience, keyed to meet today's modern demands, are your assurance of profit and quality whenever a Sterling engineer recommends the Sterling Grinding Wheel you should use. May we serve you?

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Correct HOPPER DESIGN

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TOO OFTEN OVERLOOKED by engineers and operating men is a mechanical feature of *first importance* in the efficient collection of dust: *correct hopper design.*

For example, the correct slope for the particular type of dust collected is an essential engineering "must".

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LESS FAN BLADE WEAR
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LOW POWER CONSUMPTION
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UNLIMITED CAPACITY
NO MOVING PARTS
FREE DUST FLOW

PRODUCE

HIGH EFFICIENCY
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LONG LIFE
NO CLOGGING

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DUST RECOVERY SYSTEMS

JUST OFF THE PRESS: Buell's new revised book—*"The Buell (van Tongeren) System of Industrial Dust Recovery"* — now in its fourth printing, is just off the press. Write for your copy today.

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14 Cedar Street, New York 5, N. Y.
Sales Representatives in Principal Cities

DESIGNED TO DO A JOB, NOT JUST TO MEET A "SPEC"

(*Continued from page* 174)

more friable at the edges and thin sections.

J. E. Mercer stressed the advantage of the system in regard to the prevention of silicosis. Mr. Shaw asked if the system could be applied so as to just clean the surface of the castings fairly economically, without a classifier. He also asked if oilskins could be dispensed with and if the operator could stand outside the room, directing the gun from outside.

Mr. Lloyd replied to the discussion by saying that the drawback in using the hydroblast on hot castings was the formation of steam. He said that the oilskins and helmets used were not uncomfortable, but that no claim was made that hydraulic cleaning would entirely eliminate silicosis. It was a step in the right direction. He stressed the importance of the classifier and agreed that operators could work from outside.

The next paper, by S. L. Fry, radiologist, Kent Alloys Ltd., London, was "Preliminary Investigation of Metal Pouring by Cine Radiography," in which he explained a method of observing the behavior of the metal in the mold during pouring by means of a combination of a cine camera, coupled with an x-ray set.

Discuss Gamma and X-Ray

Daniel Sharpe, past president, opened the discussion by saying that it would be very interesting if the apparatus could be used to obtain information as to the manner in which the metal traveled along the face of the mold. Mr. Fry replied in the affirmative, and said that the metal coming in over the top had a concave front. T. H. Turner asked why gamma rays had not been used, since the maintenance of x-ray plant was expensive. He also commented on the fact that in using x-rays or gamma rays for examination of solid castings, all small defects were not disclosed. Mr. Fry replied that gamma rays would probably not have enough energy to make the screen fluoresce brightly enough.

The third paper of the session was "An Investigation of the Constitution of Certain Foundry Bonding Clays," by R. W. Grimshaw and Dr. A. L. Roberts, University of Leeds. The report of this investigation was communicated by the Bradley-Foster Research Laboratory under the direction of Dr. J. E. Hurst, and was carried out in the ceramics and refractory materials section of the department of coal, gas and fuel industries of the University of Leeds.

Dr. J. E. Hurst, past president, opened the discussion by stating that part of the work was to identify the mineralogical characteristics of Colbond. The investigators had devised a thermo-analytical method which could be used in many normally well equipped laboratories without highly specialized equipment. It was very important to foundry people to be certain whether a plastic clay which was discovered at any time did contain any of the bentonite mineral.

J. J. Sheehan said that what was

(*Continued on page* 179)

JACKETS

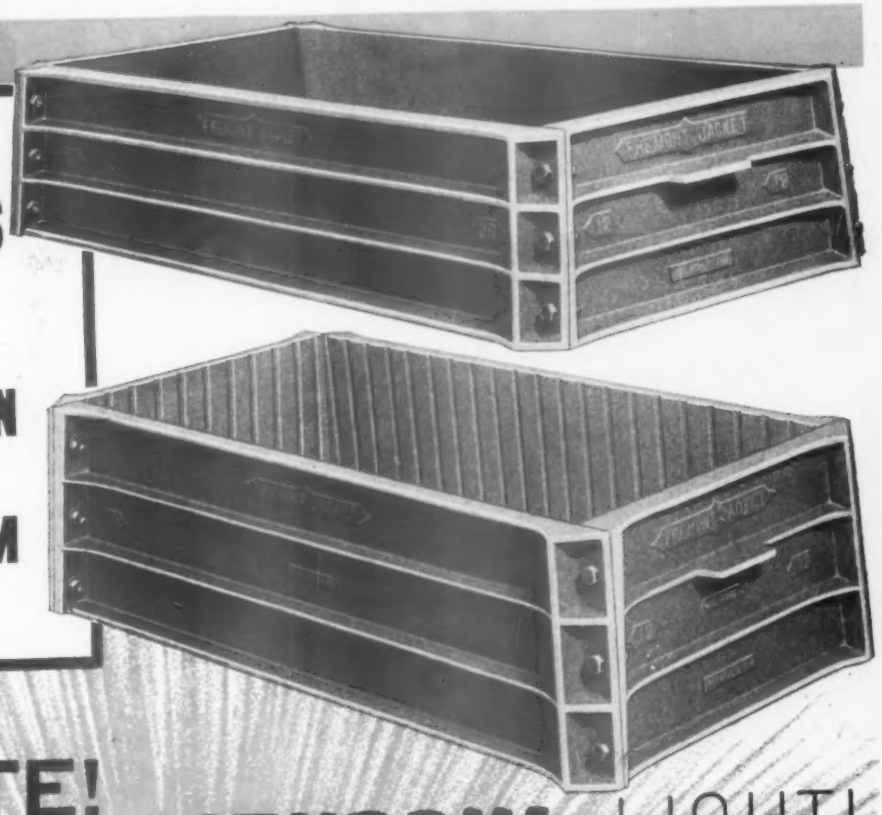
FURNISHED

IN

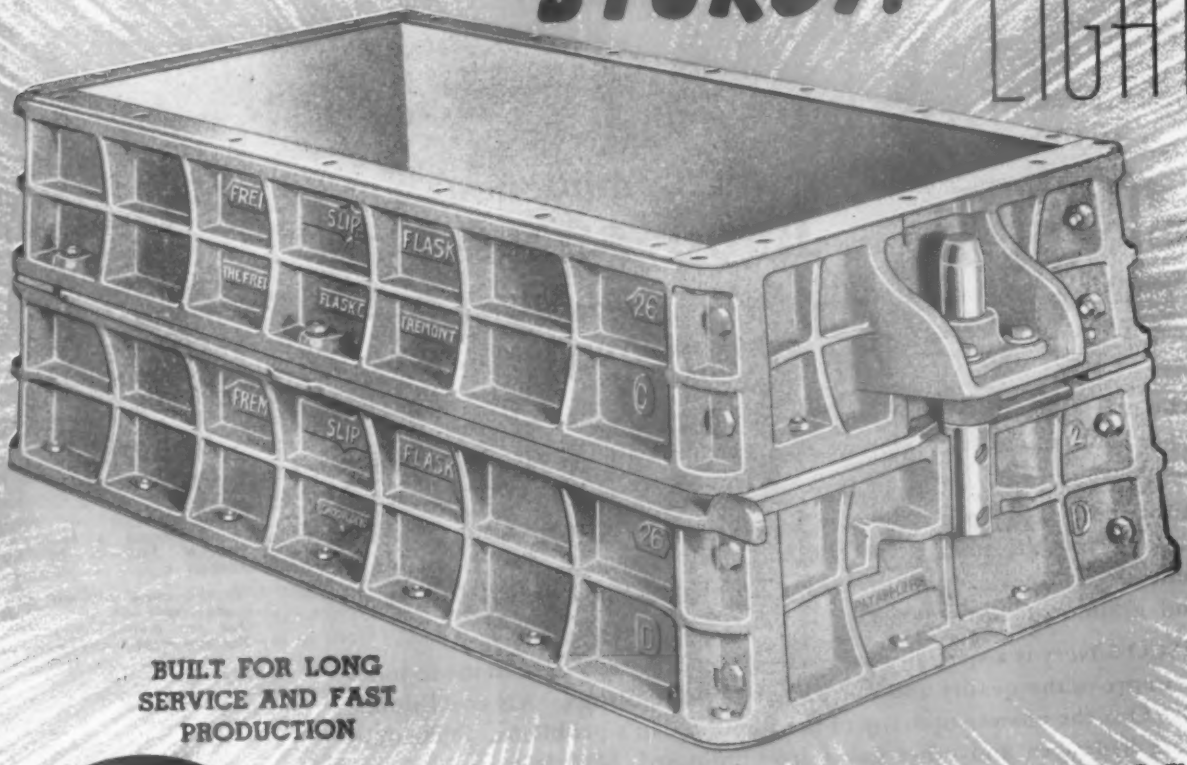
CAST IRON

OR

ALUMINUM



ACCURATE! STURDY! LIGHT!



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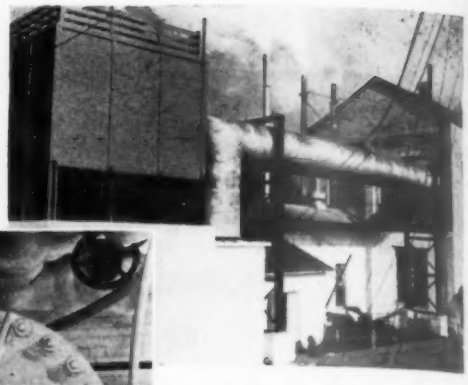
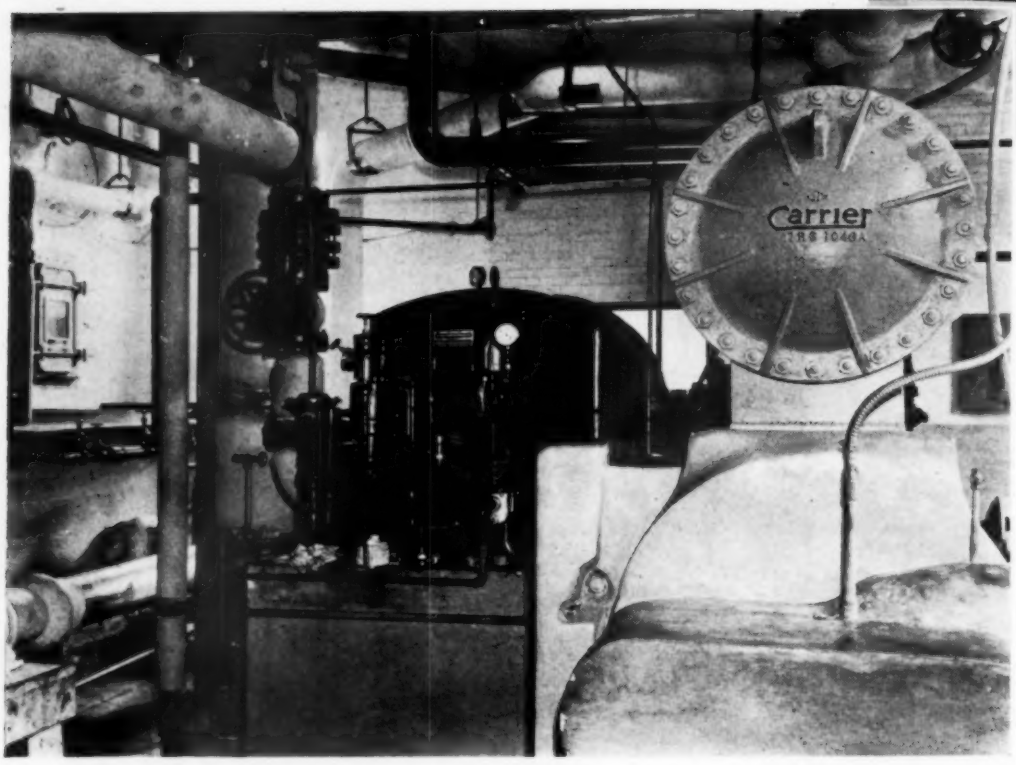


Exterior view—showing the JISCO cooling tower refrigerating plant and connecting pipes.

The JISCO air conditioning room with its modern refrigerating unit.



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Air Conditioned
JISCO SILVERY
Offers Distinct Advantages to the Foundryman

The new JISCO Blast Furnace, erected in 1942, is of the most modern type, embracing such important improvements as air conditioning the blast.

Air conditioning maintains the humidity, or moisture content of the air entering the stack at a constant low percentage. This holds the zone of fusion steady, insuring uniformity of the iron in both grade and grain structure.

JISCO Silvery is a specialty product—a blending iron used in the foundry to improve the quality and machineability of castings. Air conditioned JISCO is the answer to many of the foundryman's problems. Difficulties from hydrogen and other gases are eliminated.

May we give you further information?

Excerpt from a letter to Andrew Jackson by his mother.

"In this world you will have to make your own way. To do that you must have friends. You can make friends by being honest and you can keep them by being steadfast."

THE JACKSON IRON & STEEL Company
JACKSON, OHIO.

(*Continued from page* 176)

rather loosely called "synthetic sands" was not truly synthetic, but rather artificially bonded sands. He believed there was developing a better approach to what he would call a synthetic bond. He stressed the importance of sand flowability, and said the ideal would be to get a bonding material or sand with high refractoriness and high flowability; a plastic mold was, he stated, very dangerous and, made by a lazy molder, would produce a casting that was not accurate. Other speakers raised the point of low moisture content.

In the course of their reply, the authors referred to a point raised by Mr. Hunter on the effect of combustible matter on thermal analysis and said that if much combustible matter were present the thermal curves went haywire and the clay would first have to be treated chemically to destroy the organic matter.

At one of the Saturday afternoon sessions the American exchange paper was presented. The author was Frederick G. Sefing, International Nickel Co., New York, and the subject was "A Study of Molding Methods for Sound Castings." Vincent Delport, European representative, THE FOUNDRY, and European delegate of the AFA, first conveyed in a few words the greetings of the AFA and the expression of their sentiments of friendship towards their British colleagues and appreciation of their efforts during the war. Dr. A. B. Everest then gave a clear and concrete summary of the paper.

Discuss Exchange Paper

J. F. Chambers, opening the discussion, referred to the weight of feeder per 100 lb of casting indicated in the author's table, and to corresponding weight of metal to be fed into 100 lb of casting, and thought that the efficiency of riser was high (40 per cent for medium carbon grey iron with round feeder); he suggested that 25 per cent efficiency was the most on which one could count. Referring to the section on feeder connections, he suggested that a reduced connection might cause shrinkage of the immediately adjacent metal and that this practice should be applied very carefully. Referring to the size of risers, he said it would perhaps be more true to say that the size should be related to cooling rate, and that was not always directly related to section only. He ended by saying that attention to the principles set out in the paper was the only way to ensure success and soundness in casting.

F. Dunleavy said that there were satisfactory methods of different character from those indicated in the paper, which had not been mentioned. He suggested that an atlas should be drawn up to show the satisfactory methods as against unsound methods.

A. E. McRae Smith mentioned the use of a mica plate or some other insulating material of a very thin nature which could be used so that there would not be any real interruption in the feeding effect.

C. H. Kain expressed his appreciation

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MODEL 4000 — for wall type indicator or recorder. Has flexible arm adjustable to any angle without use of tools

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of the fact that the author had discussed castings as being a corporate family of different metals and alloys; he thought that was a step in the right direction. He then referred to the author's statement that feeders should have 50 per cent greater cross section than the section of the casting to be fed; he thought this was a very definite statement and wondered on what grounds it was made. He noticed the author condemned rod feeding, although this old method had been successfully used. With regard to the author's reference to hot topping, Mr. Kain had not found this successful in his own experience, particularly in the case of liners or rollers which were highly polished. They always found an area of open grainless metal under the head.

Mr. Finch remarked that certain points in the author's paper lead to uneconomical production; for instance the 50 per cent greater section of area, which he, the speaker, did not consider to be generally necessary. He felt, also, that the yield of castings could not be worked out on a weight basis but on the design and relation of surface area to mass. He thought the author had made an important point in saying that proper records of casting methods should be maintained for reference.

F. Cousans asked if the Americas were doing anything in the way of using insulating feeder heads.

Condemnation Not Justified

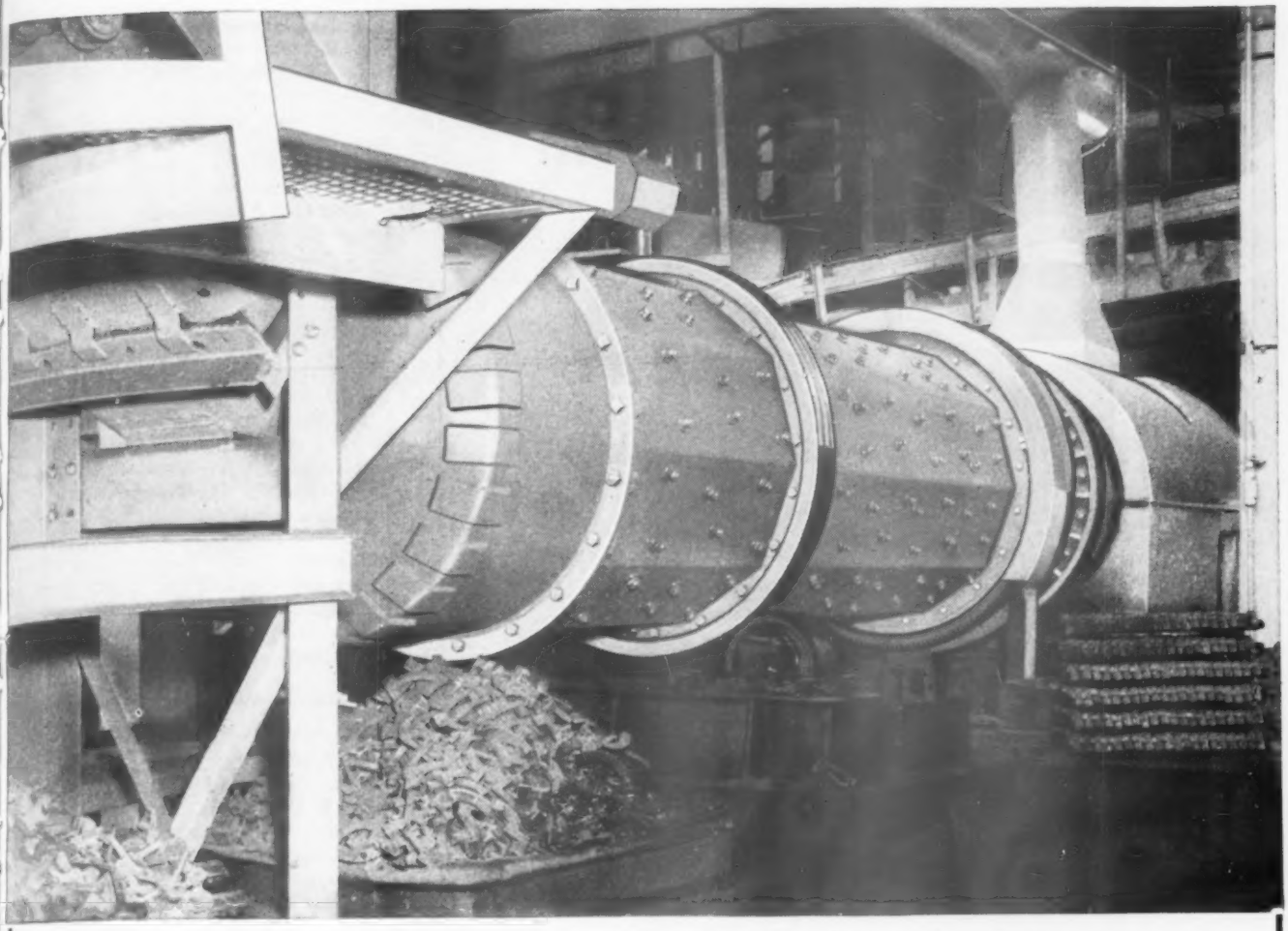
F. W. Rowe said the paper fulfilled a long standing need for the correlation of the various methods of feeding, irrespective of the metal used, but it was difficult to put down methods equally applicable to all classes of metal and based on the fundamental data of liquid shrinkage. He agreed with the previous speakers that the yield indicated in the author's table could not be as high as 40 per cent with the methods described. He also thought that a wholesale condemnation of rod feeding was not justified.

The chairman, P. H. Wilson, said that the many comments made showed the interest taken in the paper. He hoped that in his reply Mr. Sefing would elucidate the points raised in regard to his table. He supported the author's opening remarks in which he expressed the hope that international exchange papers might contribute toward peaceful scientific relationship between nations, and this expression of feeling was heartily reciprocated.

The next paper was "The Gating and Feeding of Steel Castings," by S. T. Jazwinski, chief metallurgist, E. D. Wells, foundry superintendent, and S. L. Finch, foundry methods engineer, K. & L. Steelfounders & Engineers Ltd., Letchworth.

Mr. Shadwell referred to the method of conserving heat in the feeder head mentioned by the authors; he said that for castings ranging from 5 to 150 tons the method of the electric arc was successfully used and was economical; by means of an arc one could get down to as low a percentage as 10 per cent of

(*Continued on page* 182)



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It was submitted to us in connection with this picture taken about a month ago in a foundry in Michigan:

"You will be interested in knowing that after having been in operation for approximately a year there seems to be little wear on the lining and so far as we were able to learn they have not taken up on the lining bolts.

"In fact, we doubt that anything has been done to the mill except to keep it lubricated.

"The running tracks and trunnions were in good condition and the same is true of the thrust ring and the thrust roller. The mill runs so easily that when it is stopped, as it frequently is, it rolls back and forth until it comes to rest: so all in all we think it is giving a good account of itself. They are pleased with it and are apparently willing to take another.

The mill is fed by a conveyor, discharges onto a conveyor, is started and stopped many times an hour, turns out satisfactory clean sprues, seems to get rid of the sand and dust through the louvres and does not appear to add any appreciable amount of dust to the atmosphere. It is running 9 to 10 tons per hour but has considerably more capacity."

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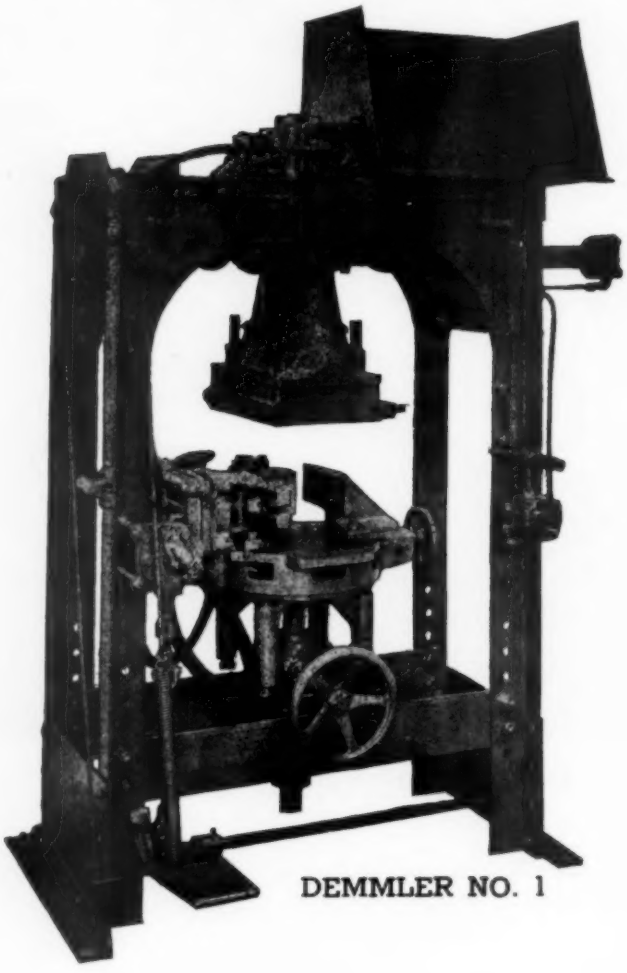

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CORE BLOWERS *Exclusively*

(*Continued from page* 180)

feeding metal without segregation.

C. H. Kain, referring to the use of chills in one example, said an alternative method of obtaining soundness was to increase the height of the subsidiary heads; chills were always a potential source of trouble. He emphasized the soundness of the principle stated in the paper that each head should be isolated in its effects and should not interfere with the efficiency of any other head. With regard to top feeding, he mentioned the method of pencil gating through a series of small gates in the top of the casting, which he had used with very good results.

Mr. Brown said that the efficiency of a head should be measured by the amount of molten metal which entered the casting. J. H. Cooper, referring to liquid contraction, said he had made experiments in which it was found that the actual contraction in steel was about 5 per cent; he said that if the metal in the head could be kept of the same quality as the original the job should be sound and without segregation.

Magnesium Presents Problems

Papers presented at the other two sessions were:

"The Cause and Control of Microporosity in Magnesium Alloys," by E. A. G. Liddiard, research manager, and W. A. Baker, investigator, British Non Ferrous Metals Research Association. As a result of their investigations, the authors found: (1) that the characteristic microporosity in magnesium alloys is due essentially to unfed shrinkage in alloys which solidify over a temperature range; (2) that the presence of gas in magnesium base alloys causes a marked increase in the amount of microporosity; (3) that owing to their low heat capacity and relatively rapid solidification the temperature distribution in many magnesium alloy castings tends to be less favorable to progressive feeding; and (4) that under the same solidification conditions, the strength of unfed castings in magnesium and aluminum alloys is affected to the same extent, but that it is more difficult to ensure correct solidification conditions in magnesium than in aluminum alloys.

"The Production of Whiteheart Malleable Iron by Annealing in Partially Burnt Town's Gas," by I. Jenkins and S. W. Williams, a communication from the staff of the research laboratories of the General Electric Co. Ltd., England. The experimental work discussed in the paper shows that whiteheart malleable iron can be produced by annealing in partially burnt town's gas, which is cheap and readily produced. Under properly controlled conditions the annealing time is considerably less than that normally found necessary with the ore annealing process.

"The Annealing of a Whiteheart Malleable Iron by a Gaseous Process," by A. G. Robiette, consultant metallurgist, H. A. Brassert & Co. Ltd., London. The process described uses mixtures of CO/CO_2 and H_2/H_2O diluted with nitro-

(*Concluded on page* 185)

KRAUSE Truscor (Light Weight) AND Amerikor (Heavy Weight) CEREAL BINDERS

PROCESSED TO PERFECTION ★ PROCESSED TO PERFECTION ★ PROCESSED TO PERFECTION ★

QUICK MIX — BLENDS WITH ALL BINDERS

Truscor and Amerikor mix QUICKLY with all other types of binders. Schedules can be stepped up.

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Truscor and Amerikor Cereal Binders give greater green strength especially with the sharp sand used to produce open cores. Save core oil.

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Truscor and Amerikor Cereal Binders produce more open cores with greater permeability. They burn out faster, more completely . . . cut scabbing, cold shut and buckling to a new low.

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From start to finish, Truscor and Amerikor Cereal Binders do a better job for you. They bake faster in the ovens . . . burn out completely . . . help you get more done.

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DALLAS 1, TEXAS, 821 Mercantile Bank Bldg.
DAVENPORT, IOWA, 918 Kahl Bldg.
DAYTON 2, OHIO, 302 Harries Bldg.
DETROIT 2, MICH., 610 New Center Bldg.
FAIRFIELD, CONN., Post Road
GRAND RAPIDS 2, MICH., 812 Michigan National Bank Bldg.
HARTFORD 3, CONN., 410 Asylum St.
HOUSTON 2, TEXAS, 1806 Commerce Building
INDIANAPOLIS 4, IND., 817 Merchants Bank Bldg.
KANSAS CITY 6, MO., 2300 Power & Light Bldg.
LOS ANGELES 14, CALIF., 108 West Sixth Street
LOUISVILLE 2, KY., 1154 Starks Bldg.
MILWAUKEE 2, WIS., 735 North Water St.
MINNEAPOLIS 2, MINN., 1060 Northwestern Bank Bldg.
NEWARK 2, N. J., 2706 Newark & Essex Bldg.
NEW ORLEANS 12, LOUISIANA, 911 American Bank Bldg.
NEW YORK 17, N. Y., 230 Park Ave.
OKLAHOMA CITY 2, OKLA., 1209 Apco Tower
PHILADELPHIA 9, PA., 123 S. Broad St.
PITTSBURGH 19, PA., District Sales, 1814 Oliver Bldg.; General Offices, Gulf Bldg.
PORTLAND 4, OREGON, 512 Porter Building
PROVIDENCE 1, RHODE ISLAND, 1421 Industrial Trust Bldg.
RICHMOND 19, VA., 213 Exchange Building, Sixth & Franklin Sts.
ROCHESTER 4, NEW YORK, 1331 Lincoln Alliance Bank Bldg.
ST. LOUIS 8, MO., 1002 Continental Bldg.
SAN FRANCISCO 4, CALIF., 615 Russ Bldg.
SEATTLE 1, WASH., 1411 Fourth Ave. Bldg.
SOUTH BEND 5, IND., 805 J.M.S. Bldg.
SPRINGFIELD 3, MASS., 301 Tarbell-Watters Bldg.
TAMPA 2, FLA., 401 Tampa Theatre Bldg.
TOLEDO 4, OHIO, 1804 Ohio Bldg.
TULSA 3, OKLA., 1405 Philtower Bldg.
WASHINGTON 5, D. C., 605 Southern Bldg.
WICHITA 2, KAN., 411 Fourth National Bank Bldg.

MAGNESIUM MAZLO PRODUCTS

REG. U.S. PAT. OFF.

AMERICAN MAGNESIUM CORPORATION

SUBSIDIARY OF ALUMINUM COMPANY OF AMERICA

(*Concluded from page* 182)

gen, these mixtures being produced by partial combustion of town's gas, coke oven gas, producer gas and carburetted water gas.

"A New Method of Investigating the Behavior of Charge Material in an Ironfoundry Cupola and Some Results Obtained," by N. E. Rambush, managing director, and G. B. Taylor, foundry manager, Ashmore, Benson, Pease & Co. Ltd., Stockton-on-Tees. The method of investigation employed by the authors was suddenly to stop the reactions in a fully charged cupola and to take samples from different parts of the burden simultaneously; the composition and condition of these samples provided the information. To stop the reactions and cool the burden before removing the samples it was decided to quench as quickly as possible the whole normal working charge by simultaneously shutting off the blast and pouring water through the charging door. It took about 40 minutes to render the charge inert.

"Tentative Recommended Methods for Casting Cast Iron Test Bars" was presented by Sub-Committee T.S.4 of the Technical Council of the Institute.

U. S., CANADA HAVE 5569 FOUNDRIES

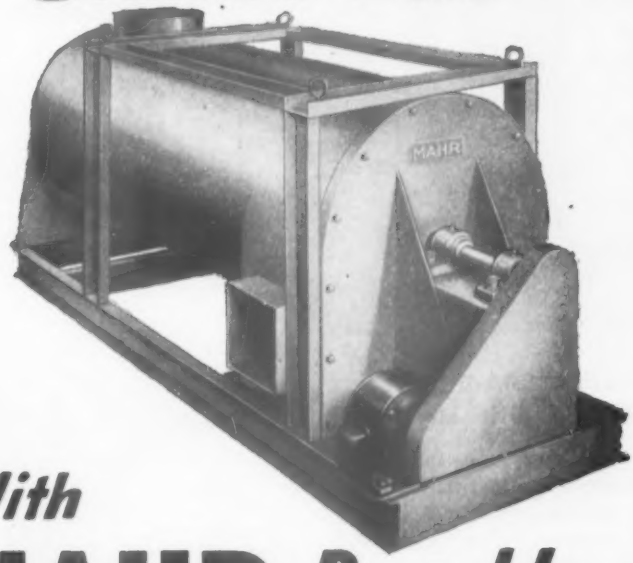
(*Continued from page* 87)

ulation was made, capacity of the United States foundry industry for producing ferrous castings has been expanded considerably more than is indicated by the gain in number of producers. Not only have many of the new plants which have been built been large ones, but numerous older foundries have been enlarged or modernized, with consequent increase in potential output. By actual count, the total number of gray iron producers declined from 2890 in 1943 to 2879 this year; 383 foundries are producing steel castings, compared with 335 in 1943, and the number of malleable producers has increased to 139 from 126 two years ago. Without making allowance for the fact that some ferrous foundries make more than one type of casting, this means there are 3401 sources of ferrous castings, an increase of 50, or about 1.5 per cent, since 1943. In Canada, the increase was from 392 to 408, or 4 per cent.

Numerically, the nonferrous group showed a much larger growth the past two years than did the ferrous industry. The tabulation lists a United States total of 3040 producers of nonferrous castings, an increase of 15.5 per cent compared with the 2631 of two years ago. Of the current total 1795 foundries produce nonferrous castings exclusively, while 1245 represent departments of plants also making ferrous castings. A large number of the "exclusive" group make more than one type of nonferrous

(*Concluded on page* 188)

"Dry from the Inside Out"



With

MAHR Portable MOLD DRYER

"DRY FROM THE INSIDE OUT"—and get better castings with less work. With the MAHR Portable Mold Dryer you make a triple time saving! 1st: Leave your big molds on the foundry floor, no chance of strain or warping by loading or moving. 2nd: Heat up time is extremely fast. 3rd: Large volumes of hot gases are forced into every part of the mold for uniform, complete drying. DRYING TIME IS MORE THAN CUT IN HALF! FOUR SIZES: 250,000, 500,000, 750,000, 1,250,000 Btu Cap. oil or gas fired.

Consult MAHR Engineers on a Modernizing Program

MAHR can supply you with practically anything in modern drying and sand handling equipment,—and the know-how to get the utmost out of it. Many foundries are now being modernized by MAHR engineers. You will not be obligated in finding out what MAHR recommends to put your foundry in top-notch condition. Send the coupon below today—or write us—and indicate the equipment you may need, also what your production problems are.

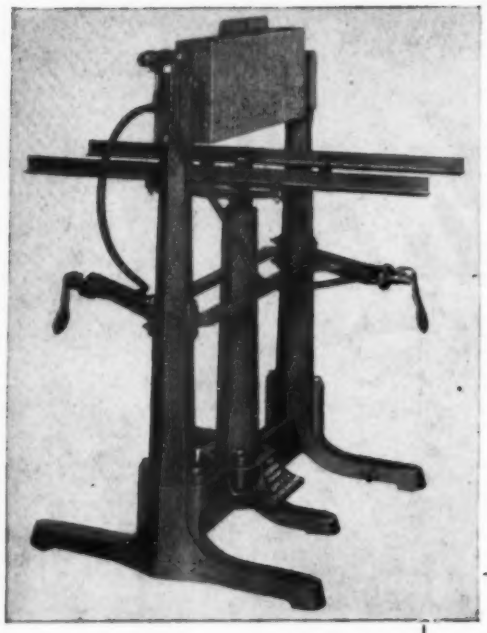
MAHR MANUFACTURING CO.
Division of Diamond Iron Works, Inc.
1709 North Second St., Minneapolis 11, Minn.

DEPT. F 845

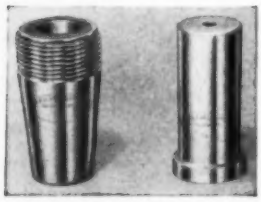
GENTLEMEN:
Give us information quickly about the following:

☐ Core ovens
☐ Mold ovens
☐ Portable mold dryers
☐ Torches
☐ Mold conveyors
☐ Sand slingers
☐ Sand conveyors
☐ Heat Treat furnaces
☐ Melting furnaces
☐ Ladle heaters
☐ Ladle dryers
☐ Complete engineering service
☐ Shake outs
☐ Vibrating screens

NAME..... FIRM.....
CITY..... STATE.....



FEDERAL



TUNGSTEN-CARBIDE BLAST NOZZLES

Cut Cleanings Costs! Reduce Your Air Costs! Cut Shut-down Time! Clean Faster and Better! You can do all these things simply by installing Federal Blast Nozzles in your cleaning equipment. Buy and install one—prove it in your own plant.

THE VIBRA-DRAW CORE DRAWING MACHINE

The ideal machine for drawing more cores and better cores than you've ever had before. The separate center stand which supports the core tray is not affected by vibration of the drawing head. Core makers draw successive cores on same core tray without shaking down cores already drawn.

The VIBRA-DRAW drawing head has 100 accurately machined grooves on each side—accommodates two core makers and ensures an accurate lift for the entire height of the draw. Our new circular tells all about it—why not write for it today?

WATER BRUSH

Easy to Grip and Hard to Tip. It can't leak and one filling lasts all day. Does not tire the molder's hand.

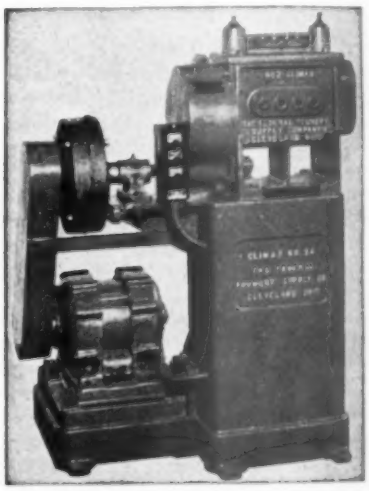
"The Twist Does The Trick"

TWISTED STEM CHAPLETS

The chaplet with everything. The "Twisted Stem" promotes rapid complete fusion. Not deformed, the stem has no weak spot to burn in and permit core shift. Made in a complete range of sizes. Samples of the size you use, gladly submitted.

CLIMAX WIRE STRAIGHTENERS

Any foundry, large or small, can cut production costs by straightening and re-using core wires and rods. With a Climax Wire Straightener this can be done quickly, economically, safely—by unskilled labor. A complete descriptive circular is yours for the asking.



All Federal Products are

THE FEDERAL FOUNDRY

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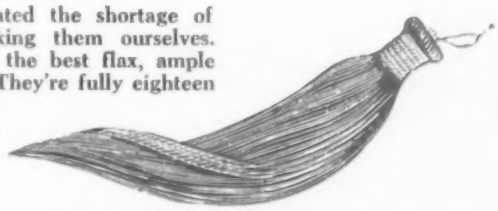
CROWN HILL, W. VA. · CHICAGO · MILWAUKEE · DETROIT · ST. LOUIS

Chamberlain Co., Los Angeles, Calif. · Pacific Graphite Works, Oakland, Calif. · LaGrand Industrial Supply Co., Portland, Ore.

SUPPLIES

SWABS—We have eliminated the shortage of this essential item by making them ourselves. Federal swabs are made of the best flax, ample in size and won't fall apart. They're fully eighteen inches long and full-bodied. Shipped from stock — the supply is ample. Jobber inquiries are invited.



RUBBER-COVERED SHOVEL HANDLES

The best insurance you can buy against damaged patterns, core boxes or flasks. The pear-shaped grip is ideal for ramming.

They will fit your present shovels or you can order your next shovels with them already installed.

CORE-JARRING MACHINES

Eliminate hand ramming and get uniformly rammed cores with Federal Core Jarring Machines. Powered by air, these machines are sturdy and long wearing. Readily available now when you need them. The present lack of experienced labor will not handicap your shop if you have Federal Core Jarring Machines.

THE LOWE ELECTRIC SIFTER

Faster sifting, better sand conditioning combine to cut costs when a Lowe is on the job. Malleable yoke creates faster sifting; more shovel clearance permits faster loading. Enclosed ball bearing motor is a miser on current. Instantly replaceable screen bottoms. Lowe-sifted sand is better sand. The Lowe's 21-inch diameter screen bottom gives you over 10% more screening surface than the conventional 20-inch screen!

WONDER CUTTER

Users say it's worth its weight in gold. Small enough to be mounted on any bench or table, the Wonder Cutter will cut round or square rods and band iron. Priced at $39.50 f. o. b. Cleveland — every foundry should own one.

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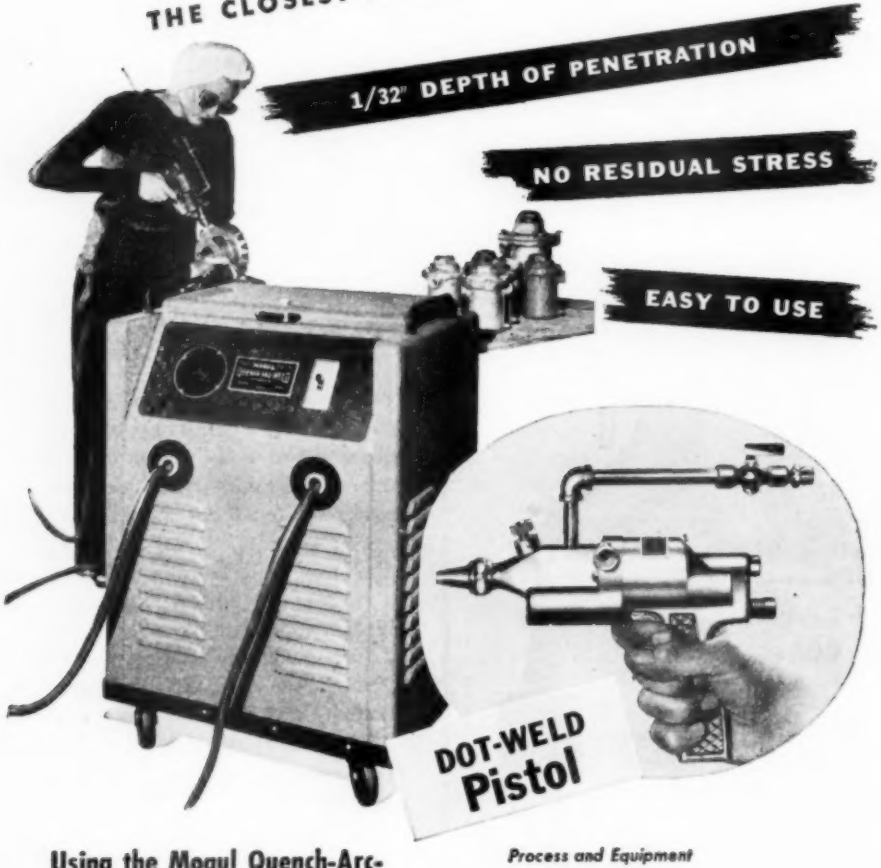
Salvage Defective Castings by the New Mogul

•DOT-WELD PROCESS

THE CLOSEST APPROACH TO A COLD WELD



Process and Equipment
PATENTED

Using the Mogul Quench-Arc-Weld Machine and the Dot-Weld Pistol

Now you can reclaim defective ferrous and some non- ferrous castings without fear of setting up residual stresses, or crystallization by the Dot-Weld Process. It affords a fast fill-in of aluminum, nickel, bronze or zinc which can be applied to any metal and is readily machineable. In addition to reclaiming defective castings, Dot-Welding is being used for press fit work, local nickel clad to eliminate corrosion and other applications never before possible.

DOT-WELDING UTILIZES the new Mogul Quench-Arc-Weld Machine, a high amperage, low voltage transformer and the unique Dot-Weld Pistol. This combination affords a depth of penetration up to 1/32" yet the specially designed air pressure unit of the pistol quenches the arc in a constant stream of cooling air.

No foundry, machine, welding or pattern shop can afford to be without the remarkable Dot-Weld Process.

METALLIZING COMPANY OF AMERICA
INDUSTRIAL DIVISION
1330 Congress Street, Chicago 7 135 Cedar Street, New York 6

WRITE FOR NEW BULLETIN

(*Concluded from page* 185)

casting, in many cases combining brass and aluminum, or aluminum and magnesium. Canada likewise has had a sharp jump in number of nonferrous producers, the increase being from 278 to 358, or nearly 29 per cent.

Brass and bronze castings still dominate the nonferrous group in the United States with 2329 producers of this type, although aluminum is a close second with 2210 sources. The magnesium total is 89 foundries. The permanent mold casting process has experienced further growth since 1943, this type of casting now being furnished by 336 foundries in the United States and 35 in Canada, compared with 258 and 29, respectively, two years ago. Producers of centrifugal castings number 187 in the United States and 20 in Canada.

War influences are indicated in the foundry expansion in some states. California shows the largest percentage growth in total number of plants since 1943—from 331 to 392, or 18.5 per cent—and now is tied with Illinois as the fourth leading foundry state in number of establishments. Two years ago it ranked sixth. The California gain has occurred principally in nonferrous foundries, a reflection of the state's aircraft industry, and places it fourth among all states and only 20 below Pennsylvania, the leader, in total producers of that type. California's 215 producers of aluminum castings are exceeded in number only by New York's 222, and it is practically tied with Michigan and Ohio for top ranking in number of magnesium foundries.

Pennsylvania Leading State

Pennsylvania still is the nation's leading foundry state, although its margin over second-place Ohio has been cut recently. Ranking of the remaining ten leading states is: New York, California and Illinois (tied), Michigan, Indiana, in 1943. Next to California, New Jersey. This group accounts for 3425 foundries, or 68 per cent of the country's total, practically the same percentage as in 1943. Next to California, New Jersey and Wisconsin showed the largest percentage increases of the leading states in total number of foundries compared with 1943, their gains being 8.7 and 8.1 per cent, respectively.

Cities having the largest number of foundries rank as follows: Chicago 170, Los Angeles 151, Cleveland 110, Detroit 102, New York 95, Milwaukee 72, Philadelphia 67, Boston 61, Cincinnati 56, Toronto 53, St. Louis 51, Buffalo 45. Pittsburgh proper has 35 foundries, although its immediate suburbs include an additional 28 plants. San Francisco and Oakland combined have 55 foundries, while Minneapolis and St. Paul together have 64.

Control of Webster Mfg. Inc., Tiffin, O., conveyor equipment manufacturer, has been acquired by Harold Schott, president, Columbia Axle Co., Cleveland, and his brother, Col. Walter E. Schott, Cincinnati.

Pea-Size to Cartwheels

Whether you're looking for a grinding wheel the size of a small pea . . . or even smaller . . . or a 42" crankshaft wheel . . . you can find it in the Bay State line.

And whatever *specifications* you're demanding . . . in respect to bond, grain, grade, shape or structure . . . a Bay State product can be provided to fill the bill—the first time and *whenever* you require those identical specifications.

Bay State's exclusive "fractional grading", "controlled porosity" and other features make it possible to achieve greater accuracy in meeting specifications on the *original order* and duplicating them exactly on each *re-order.*

Write us for literature on the types of grinding wheels you use.

BAY STATE ABRASIVE PRODUCTS CO.
7 Union Street, Westboro, Mass.

ABRASIVE PRODUCTS

Top Performance Consistently Duplicated

GRINDING WHEELS · HONING AND SUPERFINISHING STONES · PORTABLE SNAGGING WHEELS
MOUNTED WHEELS · AND POINTS · CUT-OFF WHEELS · INSERTED-NUT DISCS · AND CYLINDERS

The adventures of BILL

BY PAT DWYER
Drawings By RICHEY

BILL came in the other day to find me wrestling helplessly with the perennially impossible problem of trying to find any coincidence or resemblance between the anticipated cost of a vacation figured on a liberal basis to allow for all possible contingencies, and the actual cost as bleakly and boldly set forth by the anemic condition of the little old weasel skin purse.

"You might as well give it up." He waved one hand in careless dismissal. "Men have been working on that problem ever since vacations were invented, and as they used to say in the standard beginning of all fairy stories, that was at a time longer ago than I could tell you and twice as long ago as you could tell me. So far as I know, no person ever discovered the proper answer. Women, of course, never bothered themselves about trifles of that kind. They know in advance that the job cannot be done on the calculated appropriation —any appropriation—and then besides all that my dear, there is the preliminary or fitting out expense, a direct and staggering drain on the capital structure.

"Your reference to figuring and problems and one thing and another reminds me of one of these jobs one saves up for a rainy day. Some day when I have the time and the inclination, two important factors which unfortunately do not always coincide, I shall slip into a certain room and nip a sheet of monogrammed and delicately scented note paper from a desk at one time regarded as my property, but in recent years usurped or taken over by—ah—shall we say superior force or pressure applied so gently, steadily and imperceptibly, that I became conscious of it only recently, when, as in the present contemplated instance, I need a sheet of paper."

"If I might venture a mild inquiry, why should you go poking around a desk looking for a monogrammed and delicately scented piece of paper? Why not use a scratch pad, the back of an old envelope, or for that matter a hunk of wrapping paper? Finally, if you will pardon the expression, you poor gommick, why do you want a sheet of any kind of paper?"

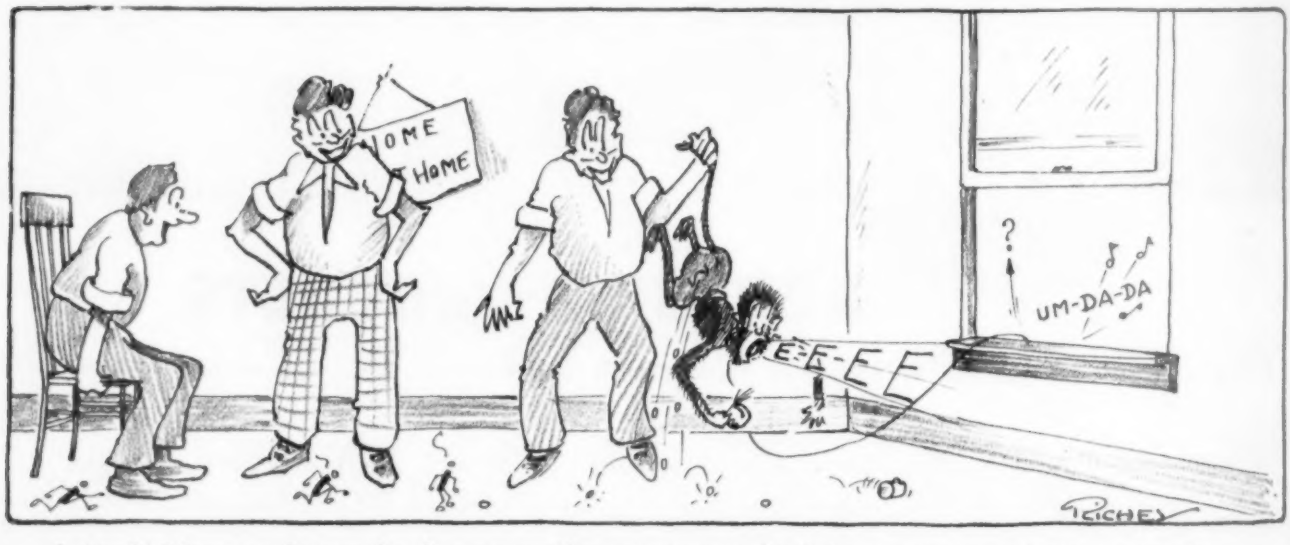
"The point is well taken, and no doubt would carry some weight if the point maker knew what he was talking about. As a plain matter of fact, and not to put too fine a point upon it, I was figuring on doing some highly involved figuring. When I do involved figuring I need clean paper and lots of elbow room, and when I say clean paper I am not referring to wall paper, tar paper nor sticky fly paper. I trust I make myself clear.

"The problem I have in mind does not lend itself readily to the bottom board or core oven door figuring technique. Neither is it connected with the well known and depressing difference between what you had left, and what you thought you would have left after a vacation. You may consider yourself lucky you did not have to wire the old man or your wife's dear Uncle Joe for a lift on the way home. This is all the more poignant if Uncle Joe is a bit of a crab with a red veined nose and two little eyes about the size and shape of two knot holes in a gooseberry bush.

"Of course you remember that although practically crawling with the Stuff, he had coldly refused to come across, or come to the rescue on a former similar occasion. What was that telegram he sent you, collect, a year ago 'Some says yes. Some says no. Nuts to you from Uncle Joe!' A delightful old fellow with such a nice sense of poetry and humor.

"This here now little problem I have in mind was suggested the other day when I was stopped on the street by a bulky bird with a two-day stubble on his puss and a wheezy breath that did not call up any visions of Grandma's garden on a dewey summer eve. Did you ever have the job of flushing the garbage can with a hose after the wagon or truck had driven away with the contents? Well, you get the general idea. I could have applied the hose to this lad with a great deal of pleasure, especially after he addressed me familiarly as 'Mike' and grabbed my hand affectionately in one of his huge paws. For one dreadful moment I was afraid he was going to kiss me on both cheeks in the continental European manner. At one time or another I have wondered idly when, where and how I should die, but certainly I never contemplated the idea of passing out from a blast of

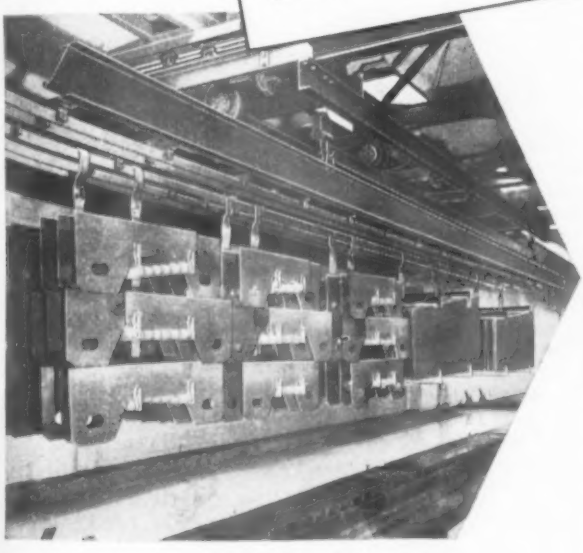
(*Continued on page* 192)



Youthful financiers discover that the main ingredient of success is the ability to recognize and seize opportunity

Special RailMaster 38' Crane with 2-way tractor drive.

American MonoRail RailMaster Crane feeds nation's largest anodizing installation



Loaded rack on crane ready for anodizing.

AN American MonoRail two-way drive Rail-Master Crane operates over six tanks that make up one of the world's largest anodizing installations. Special racks loaded with parts are lifted from one to another of five cleansing and rinsing tanks and then deposited into a chromic acid tank where the actual anodizing takes place. Some of the loads weigh as much as 3 tons.

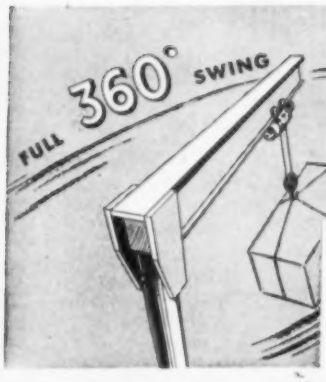
American MonoRail Railmaster Cranes of extremely simple design are developed for handling loads up to 5 tons by manual operation or propelled by rubber wheel drive.

With thousands of installations to draw from, American MonoRail Engineers are well qualified to offer solutions involving overhead handling equipment. Consultation with these men will reveal why American MonoRail equipment was selected to serve the nation's largest industrial plants. This service is offered without obligation — we invite your inquiry.

Send for Bulletin C-1, a 56 page book showing successful applications of American MonoRail systems.

THE AMERICAN MONORAIL COMPANY

13104 ATHENS AVE. ● CLEVELAND 7, OHIO



CHICAGO TRAMRAIL

JIB CRANES

SPEED

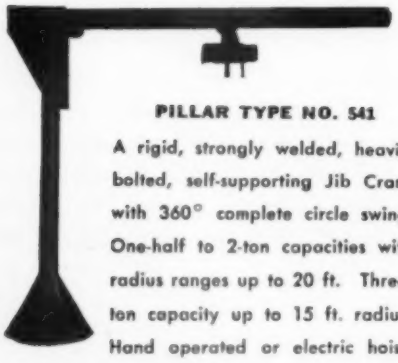
POINT-OF-OPERATION JOBS

YOU SAVE... 1. MANPOWER 2. INSTALLATION COSTS 3. COMPENSATION COSTS 4. PRODUCTION COSTS 5. MAN-HOURS

Photo courtesy of Union Pacific Railroad

The assembly of railroad wheel-and-axle units is a job that calls for precise coordination in heavy handling. Too light a job for costly overhead cranes, and too dangerous for all but the most skilled manual labor, it is an ideal application for fast-action, flexible Jib Cranes. Working in conjunction, the two nimble Jib Cranes ease the wheels into place on the axle swiftly and surely, without danger to the delicate bearing surfaces of the axle or journal. This used to be a job for skilled workmen, but now easy-to-operate Jib Cranes take over the difficult task—a real help in these labor-scarce times.

Jib Cranes help to reduce compensation costs because they lessen the probability of accidents that are so frequent in heavy handling. For example; the operation above was formerly a dangerous one. Many strains and broken bones resulted from rolling the heavy wheels into position, but now the men have only to guide the free-swinging Jib Cranes as they swing around, pick up the wheel and carry it to the point of assembly.



PILLAR TYPE NO. 541

A rigid, strongly welded, heavily bolted, self-supporting Jib Crane with 360° complete circle swing. One-half to 2-ton capacities with radius ranges up to 20 ft. Three-ton capacity up to 15 ft. radius. Hand operated or electric hoist.

IN *YOUR* PLANT

It's easy to see how swiftly, economically and safely Jib Cranes perform the operation illustrated. You can effect these same savings in your plant through the use of Jib Cranes. Look around your plant—you're sure to see many places where the use of these sturdy "mechanical muscles" will save you time and money as well as speed up production. Write for full particulars today. We will be glad to send you an illustrated circular showing the various types of Chicago Tramrail Jib Cranes together with many suggested applications for their use.

WRITE TODAY!

CHICAGO TRAMRAIL COMPANY

2910 CARROLL AVE. Phone KEDzie 7475 CHICAGO, ILL.

(*Continued from page* 190)

high octane sewer gas. After all maybe there is something in the favorite old dramatic phrase 'A fate worse than death'.

"Panhandlers of various types, male and female, have touched me confidently, plaintively, shamefacedly, boldly, timidly and occasionally carelessly. The last class usually bob up at the close of the day and always remind me of a diner stuffed to the gills or loaded down to the plimsol mark, but still inclined to trifle with a spot of dessert. With the day's take safely pouched in the old ragged breeches pocket, the chances are—let us say conservatively—that if the poucher was taken by the heels, inverted and shaken violently the pockets would assay at least 50 per cent more than the pocket in which I smuggle a modest supply of small change.

When good fellows get together

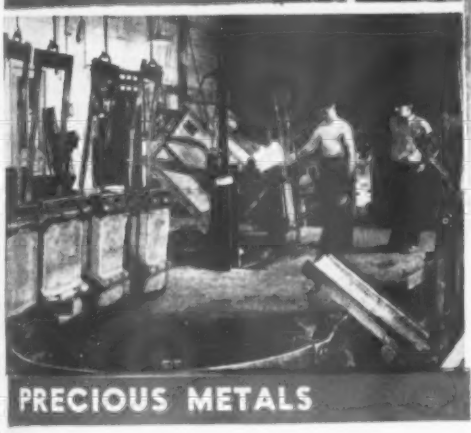
"An old friend of mine, dead and gone these many years, while reminiscing on his student days in McGill in Montreal, never failed to introduce the episode of the hurdy gurdy monkey. Flat broke and in need of a drink, George, for that was indeed our hero's name, George and a few of his boon companions sat in a room one morning in a very dejected frame of mind indeed. Providence in the form of a monkey appeared at the open window.

"Higher education teaches young men to thick quickly and clearly. The monk was coaxed into the room by sundry and divers gestures of sincere friendship. Before he had time to doff the feathered cap and make his little professional bow, one able athlete grabbed him by the long tail, held him at arm's length and shook every penny out of his tin cup and jacket pockets.

"The released and thoroughly frightened little animal went across the room like the devil went through Athlone in three standing jumps and vanished through the window with practically the

(*Continued on page* 194)

THE FURNACE YOU CAN TRUST *with* $150,000

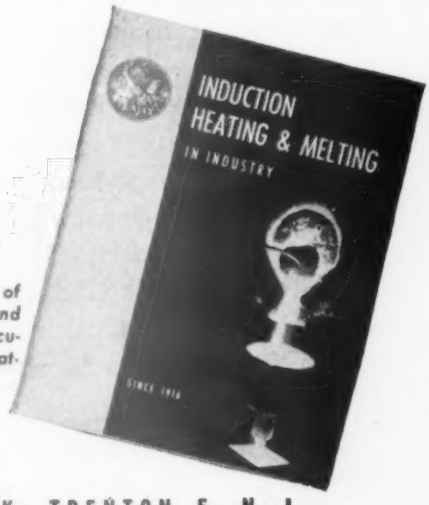


87

Gold — 4,000 ounces of it — is melted in a little high-frequency furnace. Because of its fast melting, freedom from impurities, exact yield, and high metal recovery, the Ajax-Northrup furnace is used in nearly every important mint in the world to melt gold, silver and coin metals.

Whether you are melting 4,000 ounces of gold — or 1,000 pounds of steel — or 200 pounds of tough-to-control high-copper bronze — the Ajax-Northrup furnace is the most dependable for duplicating analyses time after time with low loss of valuable constituents.

Ajax-Northrup furnaces are fast, always with perfect control. There's no time for contamination or oxidation. All the heat is produced right in the charge, and it stirs as it melts. High-frequency furnaces are ideal for small or large jobs, steady production or "rush" orders alike. Available in capacities from 8 oz. to 8 tons, with linings and pouring methods to fit all metals and alloys. Write Ajax for more facts.



Send for Bulletin 25. It shows hundreds of ways you can use induction heating and melting to save time, produce more accurate results, reduce spoilage, and do heating jobs that couldn't be done before.

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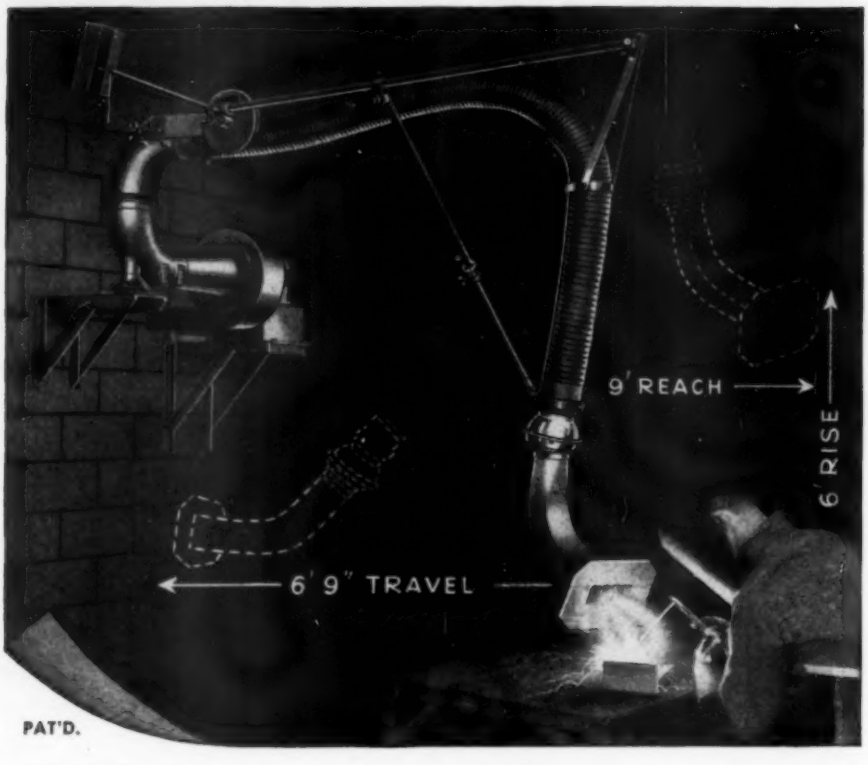

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No longer need your employees inhale welding fumes. A Ruemelin Fume Collector solves the problem, quickly and efficiently. It produces a powerful suction that draws out noxious gases, smoke and heat *at the source*. Guards employee health, resulting in less welder fatigue, therefore greater plant output. Has many exclusive features: (1) Clears shop air with minimum loss of building heat. (2) Exhaust snout can be positioned instantly and conveniently. (3) Covers maximum welding territory, vertically, horizontally and by circle swing. (4) Shipped completely assembled, easy to install. Thousands of Ruemelin Fume Collectors now serving war industries. 9 ft. and 15 ft. sizes (radius of swing).

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MANUFACTURERS AND ENGINEERS

SAND BLAST AND DUST COLLECTING EQUIPMENT, WELDING FUME COLLECTORS

A 4709-2/3-R

(*Continued from page* 192)

speed shown by you-know-who, the lad with the beard and the horns who disappears through the stage trap door in the last act of Faust. No flames accompanied the monkey's exit, but it is claimed that from that day to this, grass never has grown on the spot where the hurdy gurdy man stood and called down maledictions on the robbers. I have been told by men familiar with the subject that the left hand branch of the Italian language is in a class by itself. I knew an enthusiastic lad one time who claimed that a good blast of the stuff from a master hand and delivered at close quarters would lift the hide from a porcupine. However, one always must make allowance for racial and patriotic pride. Basing an opinion on a few chance encounters with one of these quill covered hunks of dynamite, I should be inclined to put my money on him in any kind of a go, amateur, professional, according to the rules or wide open, catch as catch can. Them thar pock-u-pines Suh, is sure bad medicine! Now if the fella had said a crocodile or a rhinoceros I might—"

"You might go on talking all night," I interrupted. "Keep on going around in circles. And as radio's pompous, patronizing, pain-in-the-neck used to say —I stopped listening to him years ago— 'Where you stop, nobody knows'.

"You start talking about a sheet of paper with figures. Then you drag in a hairy mujik with an offensive breath, and wind up with a more or less motheaten yarn about a famous institution of higher learning, topped off with a monkey and a hury gurdy man who displayed a remarkable degree of skill and fluency in the use of his native language. How would you like to shake out the whole mess and ram up the first pattern, the sheet of paper all covered with figures?"

"Well," said Bill, "I'll tell you. I am beginning to doubt that I ever shall get around to this job I have in mind, a statistical calculation of all the coin I have dribbled away in the form of tips, gratuities and charity as a result of sly inuendo or open and brazen solicitation. Too many interruptions. I was all set the other day, tools all laid out, sleeves rolled up and mind honed to a razor edge. Along comes an air mail letter from a friend of mine in South America. I could tell you the exact name of the place, but the Great White Father in Washington or one of his alphabetical bureaus might be peeved. So, let's skip it. Anyway, I always stumble over the spelling and the pronunciation. Le's see. Ah, here is the document:

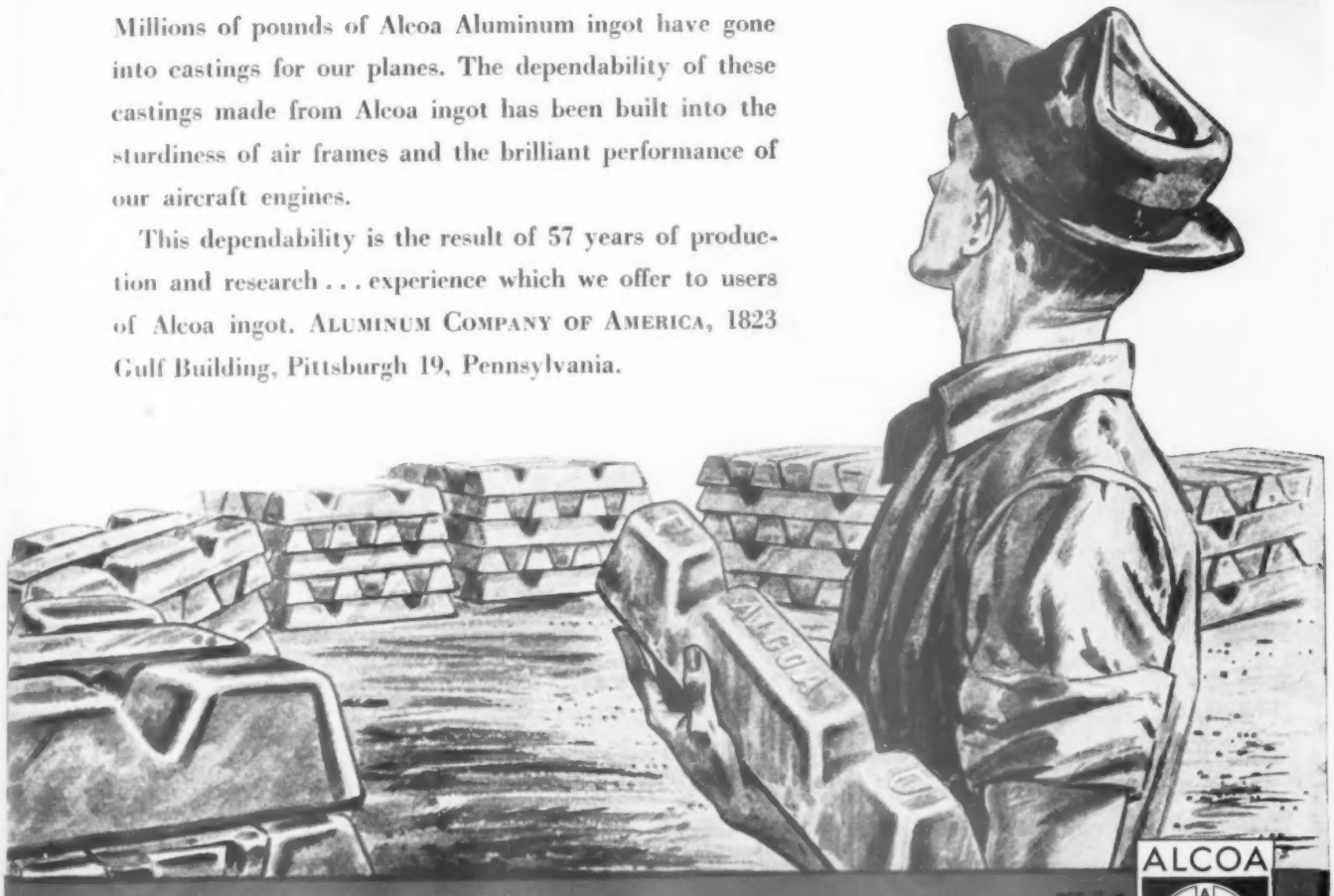
"To clear up a generally unsatisfactory condition in our small brass foundry we shall appreciate information on the following items: 1—Providing the same analysis is maintained, can brass be melted several times without the addition of new material? 2—What is the correct pouring temperature for

(*Continued on page* 196)

Ingot that flies to work

Millions of pounds of Alcoa Aluminum ingot have gone into castings for our planes. The dependability of these castings made from Alcoa ingot has been built into the sturdiness of air frames and the brilliant performance of our aircraft engines.

This dependability is the result of 57 years of production and research . . . experience which we offer to users of Alcoa ingot. ALUMINUM COMPANY OF AMERICA, 1823 Gulf Building, Pittsburgh 19, Pennsylvania.



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Contains illustrations and specifications of different pallet designs.

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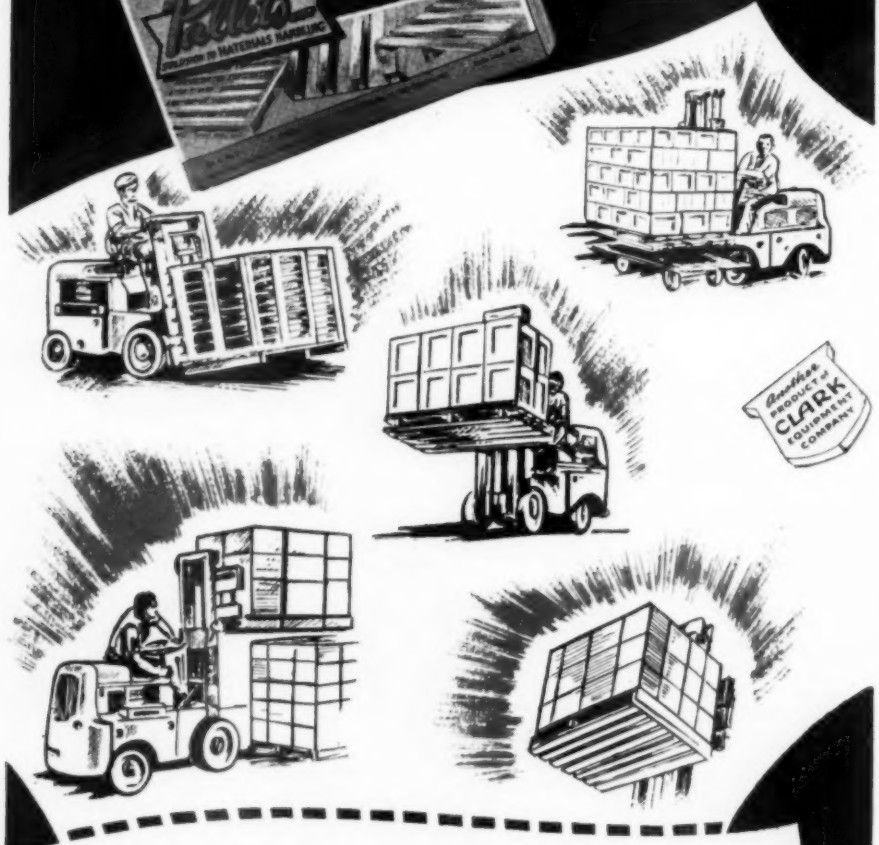

CLARK TRUCTRACTOR DIVISION

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I would like a copy of your book "CLARK BOOK ON PALLETS"

Name.....

Company.....

Address.....

City.....Zone....State.....

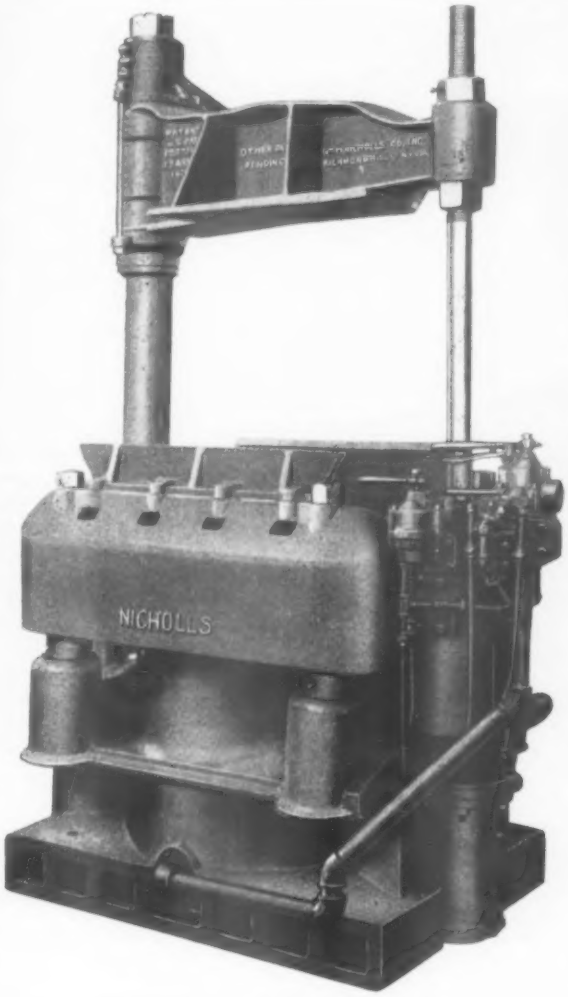
(*Continued from page* 194)

metal of the following compositions (a) Copper 84.4 per cent; tin 13 per cent; 50-50 copper nickel 3 per cent; 15 per cent phosphor copper 0.7 per cent. (b) Copper 90 per cent; tin 3 per cent; zinc 7 per cent. (c) Copper 77.7 per cent; tin 12.6 per cent; 15 per cent phosphor copper 9.7 per cent. (d) Copper 70 per cent; zinc 30 per cent. 3.—What is the proper permeability and moisture content of sand for brass castings up to 1 pound in weight. 4—How can oxidation be prevented and how can molten metal be deoxidized. 5—What is the correct pouring temperature for aluminum in sand molds. 6—Same as No. 4 as applied to aluminum.

"Replying to the Senor I regretted that apparently he did not have a back file of THE FOUNDRY where brass foundry practice is discussed almost constantly. It was rather difficult to compress into a letter all the information he wanted. The following outline was submitted for his consideration:

"Brass may be remelted repeatedly, but a certain amount of new material must be added each time to compensate for melting loss which affects both volume and composition. This applies particularly to the tin and zinc content. Copper, tin and lead are lost from oxidation, zinc from vaporization and lead and phosphorus from oxidation and vaporization. Quantity of each metal lost depends on the method used, nature of the charge, temperature, alloy composition, furnace atmosphere and the protective covering. 2—Selection of pouring temperature depends on the type of casting, size, weight, gating system and metal composition. The desirable temperature is the lowest which will give the best properties with the least number of missruns. Normal range varies from 1850 to 2350 F. 3—For the copper base alloys in general a sand with a clay content of 15 to 20 per cent for fine castings, and of 10 to 15 per cent for medium and heavy castings is desirable. Permeability not less than 10 according to AFA standards for fine castings and not less than 15 for medium and heavy castings. Green strength should not be less than 5 pounds. Moisture content varies to some extent with the type of sand, but usually is in the vicinity of 6 per cent. 4—All the component parts of ordinary brass readily are oxidized at the temperatures to which they must be heated for pouring. Hence it is necessary to sacrifice some combustion efficiency to maintain a furnace atmosphere that does not cause excessive oxidation. This atmosphere is maintained by permitting a certain amount of carbon monoxide to remain unburned. The amount varies with the type of furnace and other conditions. For the copper base alloys containing zinc the best deoxidizer is zinc which reduces the copper oxide to metallic copper. Some zinc should be held aside from the original charge and added to the molten metal when it is removed from the fur-

(*Concluded on page* 198)



33-54 TYPE "D" MOLDING MACHINE
33" Squeeze Piston 13" Jolt Piston

A Flask Roll-Off Attachment is available as an extra accessory

Heavy Duty Molding Machines

GUARANTEED WORKMANSHIP—

Smooth, sensitive operation is built into all moving parts of Nicholl's Molding Machines by expert mechanics skilled in their specialized tasks. Close tolerances are made possible by a system of accurate jigs and fixtures.

PERMANENT ALIGNMENT—

The main support base with its brackets, cylinder and upright bearings are all cast in one piece for rigidity to avoid mis-alignment and loose parts from constant jolt and squeeze operations. The overhead cross arm and the squeeze head are braced with heavy ribs and supported by an outboard bearing. This design maintains permanent alignment and provides an equalized squeeze. The entire assembly swings by pneumatic power on double roller bearings. The control is combined with the others at the front of the machine handy to the operator.

Can also be equipped with Push-Button Control for all operations, including Automatic Jolt and Squeeze Timing.

Illustration at right gives close-up rear view of heavily braced squeeze head showing pneumatically powered cylinder mechanism.

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NICHOLLS

Tubal-cain really could have gone to town . . . .

If he could have dipped into our comprehensive files of complete alloy research information.

According to Genesis, 22-4, Tubal-cain was "an instructor of artificers in all works of brass and iron"—the first reference written concerning alloys. The brass and copper of Tubal-cain's day were truly alloys; they were mixtures of metals, but they varied almost as much as the weather. No variation is found in NIAGARA FALLS SMELTING & REFINING CORPORATION alloys. Every pound of every shipment you receive will be the EXACT QUALITY you specify. Moreover, we can make deliveries to conform to the most critical production schedules. Our technical staff and our complete, accurate research files are open at all times for consultation.

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America's Largest Producers of Alloys

BUFFALO 17, NEW YORK

(*Concluded from page* 196)

nace.

"Where the alloy does not contain appreciable amount of zinc the general practice is to deoxidize with phosphor copper. 5—Correct pouring temperature of aluminum in sand molds is approximately 1275 F. However, as with other metals, the pouring temperature must be increased over the theoretical where the metal is poured into thin section castings, or has to flow an exceptional distance. 6—Since aluminum alloys readily absorb gases and oxidize at high temperatures, the melting and holding temperatures must be carefully controlled and kept as low as possible. With a careful selection of materials and satisfactory melting and handling practice, fluxing may be unnecessary. Solid and gaseous fluxes are used but the solid fluxes, volatile or stable chlorides and fluorides are the more common. Certain salts, chlorides of aluminum, zinc, titanium and boron are volatile at the melting temperatures of aluminum alloys and act as mechanical fluxes. The stable salts, sodium or potassium chloride and cryolite are liquid at the melting temperatures of aluminum alloys. They dissolve the oxides and protect the alloys from further oxidation by forming a coating over the surface. A typical charge should be fluxed satisfactorily by 1 oz of zinc chloride per 100 lb of metal.

Machine Tool Users Prefer Cast Bases

A recent study by the editors of STEEL covering postwar desires of users of machine tools included a question on the types of bases which are preferred. The report of this study, which was published in a recent issue of that publication, carries the following comment:

"Improvement in welding techniques have been accompanied by developments of better ferrous alloys and foundry practice. Therefore, careful engineering considerations now are involved in choosing weldments or castings. Among plants employing over 1000 workers, cast bases are preferred by 48.1 per cent, welded bases by 26.7 per cent."

Gives Foreign Terms For Welding

American Welding Society, 33 West Thirty-Ninth street, New York, has made available a 16-page pamphlet, entitled "Glossary of Foreign Welding Terms," which supplements standard or engineering dictionaries. Contractors, students and others who may have occasion to consult welding drawings or specifications using German, French, Russian or Spanish terms will find it valuable since it is claimed that many of the terms are not found in standard works. Copies of the glossary may be obtained for 50 cents each from the society.

Your reconversion plans should include

PERMANENT DUST CONTROL

12,000 and 15,000 c.f.m. collectors handling shakeout and sand blast dust.

The competitive era ahead calls for good foundry working conditions, including well ventilated operations. Too, operating and maintenance costs, including those of dust control equipment, must be kept at a minimum. For these reasons Schneible Multi-Wash System is the choice of an increasing proportion of the foundries which are planning dust collecting equipment for the postwar period.

The illustrations show how one midwestern foundry has been permanently equipped for dust control. The 15,000 and 12,000 c.f.m. Senior Multi-Wash Collectors shown at right maintain clean working zones at the shakeout and sandblast. The 7,000 c.f.m. Junior Multi-Wash Collector serves the grinding room which, with duct installations, is also shown.

A 7,000 c.f.m. Junior handles grinder dust.

Schneible Multi-Wash dust and fume control equipment has abundantly demonstrated its ability to provide clean air indefinitely with little attention and minimum maintenance. Exclusive features include: no accumulation of dust to dispose of, and no moving parts to quickly wear or require frequent replacement. Water employed as the cleaning medium is used over and over again. A Schneible Multi-Wash System provides the greatest ultimate economy.

Interior of Schneible ventilated grinding room.

Write for informative bulletins.

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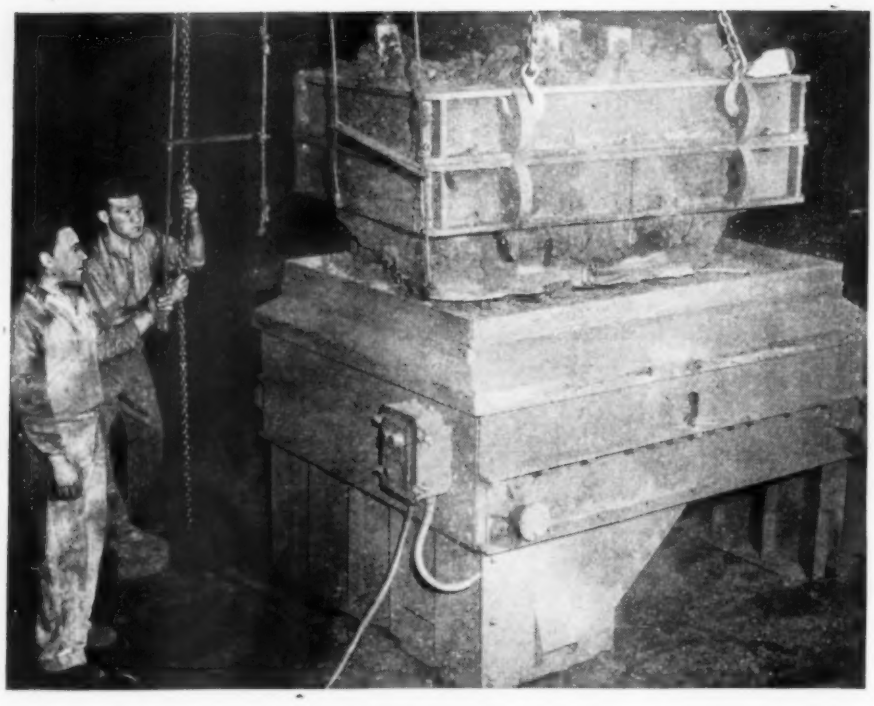
SCHNEIBLE

LIQUID-VAPOR INTIMATE CONTACT EQUIPMENT for DUST COLLECTION ABSORPTION CONDENSATION AND TEMPERATURE REDUCTION



"... omit one shift in our operations"

THE problem of getting suitable help in foundries is tough—and is getting tougher. It is not so much a matter of men not wanting to do the work—they are just not able to do it. And you will admit that much of it really is backbreaking.

Shakeout work, for example, is manual labor of the hardest sort—if it is done manually. But anyone can handle it with a Robins Floatex Shakeout . . . handle it not only easier but faster.

One of the latest companies to find that out is a large western steel works. A few days after a 48" x 72", 6-ton Portable Floatex started working in that plant, the superintendent said, " . . . the installation of this Shakeout will allow us to omit one shift in our operations."

That means that all the men will be employed on a single shift. Faster production and more of it will result—as it has whenever and wherever Robins Floatex Shakeouts are introduced.

Get the facts about Floatex . . . the Shakeout that helps you lick the labor shortage . . . the Shakeout that is genuinely full-floating . . . that shakes the flask, not the building. When writing, please address Dept. F8.

Robins Floatex Shakeouts are made in Portable models for loaded flasks weighing up to 17 tons; in Standard models, up to 100 tons or more—non-discharging and self-discharging types; with and without flask loaders.

ROBINS *makes:* BELT CONVEYORS • COAL AND ORE BRIDGES • BUCKET ELEVATORS • CAR AND BARGE HAULS • CAR DUMPERS • CAR RETARDERS • CASTINGS • CHUTES • CONVEYOR IDLERS AND PULLEYS • CRUSHERS • FEEDERS • FOUNDRY SHAKEOUTS • GATES • GEARS • GRAB BUCKETS • PIVOTED BUCKET CONVEYORS • VIBRATING SCREENS • SCREEN CLOTH • SELF-UNLOADING BOAT MECHANISMS • SKIP HOISTS • STORAGE AND RECLAIMING MACHINES AND SYSTEMS • TAKEUPS • LOADING AND UNLOADING TOWERS • TRIPPERS • WEIGH LARRIES • WINCHES • WINDLASSES

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PASSAIC • NEW JERSEY

MATERIALS HANDLING MACHINERY

NAVY YARD MAKES BRONZE PROPELLERS

(*Continued from page* 103)

nonferrous castings in almost endless variety. Castings in a navy ship amount to only 3 per cent of the total weight, but from the propeller aft to the anchors hanging from the hawse pipes forward, they constitute a highly essential feature.

In addition to propellers, the nonferrous department of the foundry shipped 7500 tons of miscellaneous brass and bronze castings in the period July, 1942—December, 1944. During the fiscal year July, 1942—June, 1943, the foundry turned out 384 manganese bronze propellers, total weight, 3,878,443 lb. In the following fiscal year July, 1943—June, 1944, the output was increased to 669 propellers, total weight 3,377,186 lb, and 936 small propellers weighing 324,530 lb, or a total of 1605 propellers with a total weight of 3,701,216 lb. The increase was in the number of wheels, the large number of small wheels, and not in the total weight. From Jan. 1 to Dec. 31, 1944, the foundry produced 1525 propellers, to a total weight of 4,305,025 lb.

Yard Tackles Freak Design

The list covers small and large propellers for all types of navy and merchant ships and included two 35,000-lb wheels for two ships of a friendly foreign navy. One of these wheels with *five* extra wide and, therefore, overlapping blades, presented a fairly intricate problem in constructing the mold. The more or less vertical parting line on a three-blade wheel, permits the cope to be lifted readily. Occasionally, a four-blade wheel presents an overhang for a short distance from the hub, necessitating the formation of a drawback. Up to the present the five-blade propeller constitutes a record in history of the yard and probably represents the ultimate limit in design among members of a profession who differ more widely on propeller theory than the exponents of the various religions of the world differ on the roads leading to eternal salvation.

In this connection, and by way of digression, it may be interesting to note that almost every operating chief engineer has his own pet theories on propeller design. If he could only persuade those who sit in high places to give him a wheel to his specification, he is quite certain he could knock a few extra knots out of the old derelict, and reduce the coal and oil bill to a gratifying extent. Fortunately—for the foundry—the majority of these dream children never emerge from the swaddling clothes, half dozen sketches and a note book filled with more complicated and abstruse mathematical calculations and formulas than Einstein found necessary to explain his theory of relativity. They constitute

(*Continued on page* 202)

CONTROL

IS THE THING.....

Whether it's directing artillery fire, or turning out non-ferrous alloy ingot to definite and rigid specifications—control is the thing.

Rapid Analysis made while the alloy is still in the furnace enables us to make necessary adjustments in its composition, so the ingot, when cast, will be exactly what your order calls for.

If your products use or can use non-ferrous alloy ingot, remember us as a completely dependable source with which to do business.

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NON-FERROUS SCRAP METAL REFINERS FOR OVER 50 YEARS

NEW and UNIQUE! » THE CARTRIDGE BENCH CORE BLOWER

*Users report remarkable increases in quality and quantity of production

Produces variety of intricate cores with unusual speed and simplicity.

Comes ready to use—virtually no installation cost.

Can be operated with unskilled labor—extremely easy to use.

If you make cores 2 lbs. or under—this unit ideally suited to your use.

Designed by two practical foundrymen.

WRITE for complete details and new booklet

Core boxes can be made very light, in most instances bench equipment now used can be converted for blowing. Almost any sand now commonly used on the core bench may be used for blowing cores. Adjustment for boxes of different height, size and shape made instantly.

To operate, core box and cartridge are held down by pressure handle while left hand operates blow valve. After core has been blown, the box is pulled forward and cartridge is lifted off and the work of drawing core is completed on base of machine.

FILLS NEED FOR SIMPLE, FLEXIBLE BLOWER

The New *Redford Cartridge Bench Blower* has met with enthusiastic acceptance by foundrymen because it supplies an important need in the foundry for an efficient, low-cost method of blowing small, intricate cores. It requires no large volume of air and readily lends itself to handling a variety of core boxes. In fact, they tell us that it is the ideal method of making cores in single or gang boxes requiring a maximum of 2 lbs. of sand.

SAND CARTRIDGES AVAILABLE IN 8 STANDARD SIZES

Blower comes complete, ready to use. Each blower provided with one Size "C" sand cartridge which is adaptable to a large range of core boxes. Cartridges are available in seven additional standard sizes and special sizes furnished where needed.

★ Cartridge Bench Core Blowers

Redford IRON & EQUIPMENT CO.

Phone: REdford 8610

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(*Continued from page* 200)

highly interesting subjects of discussion over fist-banged boards where chiefs and up and coming lesser lights occasionally come up for air, the opportunity to air their views, and a readjustment of the contents of the ballast tanks.

So far as the present description is concerned, interest in the problem does not begin until the pattern has been completed and delivered to the molder. A complete and authoritative description of layout and construction detail of wood patterns for propellers was presented in the January, 1945 issue of THE FOUNDRY.

Under ordinary peacetime conditions the market for propellers is not as extensive, and the output is not as great, as for many other types of castings, for example car wheels, pipe, plumbing supplies or automobile castings. Therefore, in many instances a pattern may not be used more than once, or occasionally only at long intervals. For that reason the pattern for a large wheel is confined to a single blade and a one-third or one-fourth section of the hub, depending on whether the wheel is to have three or four blades. When duplicate wheels are ordered in considerable numbers, as they have been during the immensely expanded ship construction period of the past few years, the foundry has reduced the molding time to a considerable extent, by making one complete propeller casting from the original wood one-blade pattern, and then utilizing the resulting casting as a pattern for making the molds for all succeeding castings conforming to the same specifications.

Castings Made in Loam Molds

In some foundries propeller molds are made in a suitable grade of molding sand and dried in an oven, or according to other recognized methods. In other places the molds are made in a sand bonded with cement, and air dried. A prominent installation of this kind was described in the September and October, 1943 issues of THE FOUNDRY. In a third method, and this is the method practiced in the Navy Yard foundry at present under discussion, the molds are made according to the loam molding method. Each method has its advantages and disadvantages. Proponents of each method can advance many reasons for their particular choice, whether dictated by personal preference, or by necessity. Crane and oven facilities, floor space, available rigging, training and experience of the shop crew, cost of operation based on total tonnage output as against elapsed time are among the many factors involved. Since no actual figures are available for publication, any discussion of this phase of the subject may be omitted from this presentation. (Editor's Note: Since this was written the foundry has switched over to the sand molding method. The pattern is supported on a concrete match and the sand in a one-piece drag and a one-piece cope is rammed by a sandslinger. A description of the new method will be presented in an early issue of THE

(*Continued on page* 204)

LOOK AT ALL THE FACTS . . . AND YOUR CORE OIL WILL BE PENOLYN!

We'd like to know you! Write to us. Your inquiries will be heartily welcomed . . . and you'll find our answers really worthwhile.

1. **UNIFORMITY** — rigid laboratory controls; no "settling out" in drums or storage tanks.

2. **CONCENTRATED FORM** — high sand to oil ratio; economical.

3. **NO OBNOXIOUS ODOR** — during mixing, baking or pouring.

4. **NO SEEPAGE** — will not settle or drain to the bottom of sand mix or green, unbaked cores; baked cores will not stick to plate.

5. **NO CRUSTING OF GREEN MIX** — air dries slowly; green mix can be stored as long as 24 hours and still be usable.

6. **CLEAN WORKING** — eliminates frequent cleaning of core boxes; sharp draws.

7. **WIDE TEMPERATURE BAKING RANGE** — small and large cores can be baked at the same time; no burnt cores.

8. **POLYMERIZED FORMULATION** — maximum strength right through to center of baked core; dryer and plate side of equal hardness as exposed surfaces; no adherence.

9. **MINIMUM GAS** — less venting; fewer blows; lower casting losses.

10. **AMPLE COLLAPSIBILITY** — no hardened lumps to dig out; disintegrates while allowing metal to solidify and cool; fewer cracked castings.

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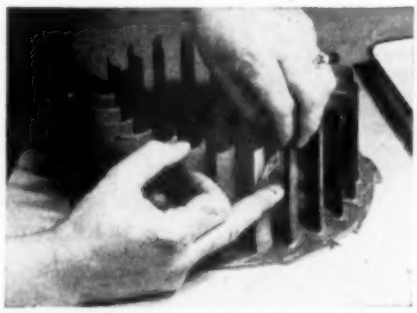
TRADE MARK REG. U.S. PAT. OFF.

(SUITABLE FOR PRODUCTION PATTERNS!)

SAVE TIME! LABOR! AND MATERIAL!

1. A felt-like cloth in thicknesses from .023-.105". (Shrinks slightly after applying.)
2. Softens by dipping momentarily in special solvent.
3. Shapes to any contour.
4. Bonds permanently to wood or metal.
5. Hardens and works exactly like wood.

Fitting a Compound Curve



Building Up a Metal Pattern

Hundreds of Pattern Shops and Foundries are finding this new lagging plastic the answer to many of their most difficult problems in building up patterns to any required thickness. It saves patterns that would otherwise be scrapped. It enables them to deliver jobs on time. It saves waste due to last minute changes in design. It is ideal for repairs also! Write for full details, easy directions for use, complete specifications and prices.

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WELLMAN MAGNESIUM PATTERN PLATES!
⅓ Lighter . . . ⅓ Stronger than Aluminum.
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Also Machined and Plain Cast Aluminum Plates.
Order by FLASK size!

(*Continued from page* 202)

FOUNDRY.)

The only difference between the wood pattern for the production of a single casting, and one designed for the production of a casting to be used later as a pattern, is that only a single shrinkage allowance is incorporated in the first instance, while a double shrinkage allowance is provided in the second instance. Since normal shrinkage of manganese bronze is $\frac{3}{16}$-in. per ft, the total shrinkage on a 20-ft diameter propeller wheel is appreciable. The rim of the single blade on the wood pattern and on the resulting four-blade bronze pattern is approximately 1-in. thick. This is to prevent small cold shuts or cracks that might be formed if the blade were cast to the finished feather edge design. In the machine and finishing department, the extra metal is removed, along with any other metal that may interfere with smooth and accurate contour desired, a contour resembling, and probably suggested by Nature's most wonderful water propulsion unit, the tail of a fish.

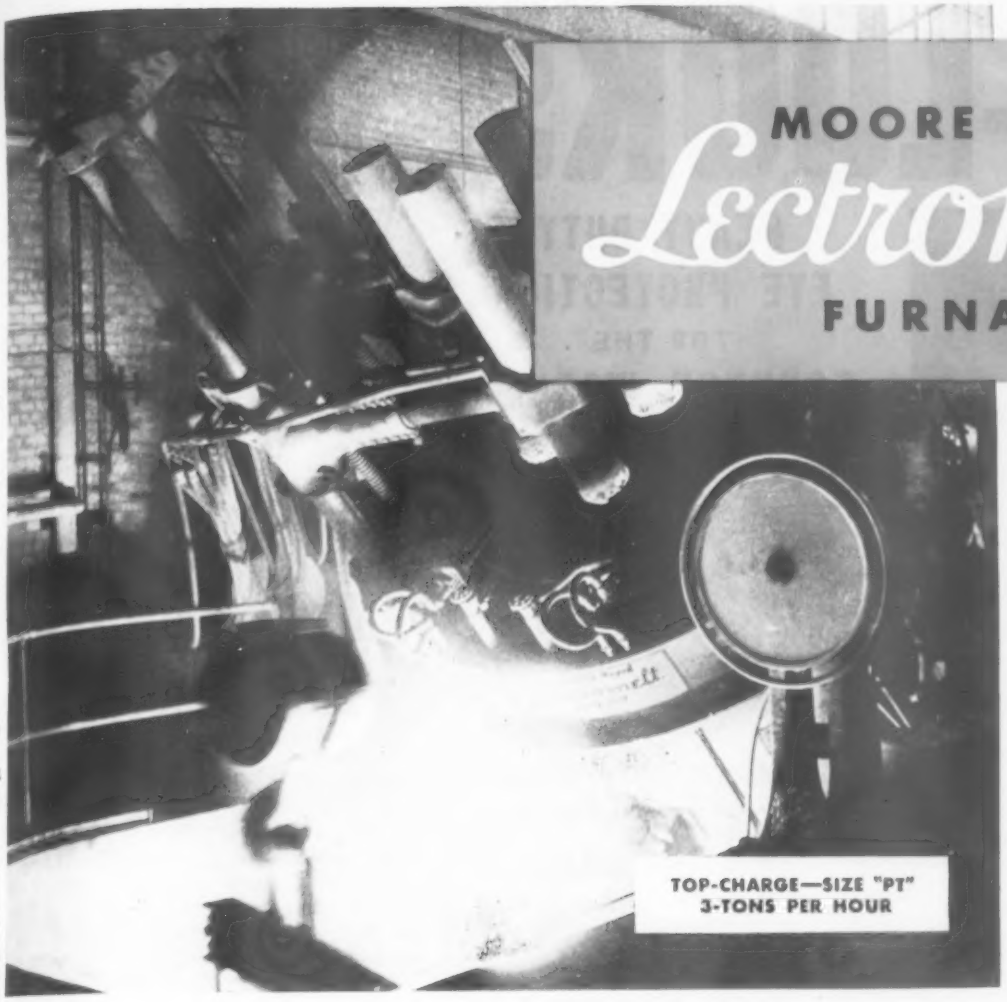
Approximately one-third of the main bay of the foundry is devoted to the production of large propellers. The molds are made in a series of concrete walled pits 25 ft square and 6 ft deep. In the regular program the initial work on one mold coincides with the completion of work on another. In the meantime, construction of the other molds in the group is in various stages of progress. When the copes from several molds are lifted, they tax the floor space in the vicinity of the pits. They also tax the capacity of the cars and the large oil fired ovens in which they are thoroughly dried for a period of 5 to 6 days and nights. The pits are covered with corrugated steel sheets, and the lower or drag part of each mold is dried with hot air driven in through a gas burner.

Sand Rammed Around Mold

A heavy, circular cast iron plate, adjusted true and level in the bottom of each pit, serves as a foundation on which to build the mold. Later it is used as an anchor for the bolts and binder bars which clamp the mold firmly and prevent movement or distortion of any kind while the mold is subjected to the static pressure of 15 to 20 tons of molten bronze under a 10 or 12-ft head. Sand rammed between the brick wall of the mold and the concrete wall of the pit prevents lateral expansion. Around the upper part of the mold, the amount of sand and ramming effort is reduced materially by enclosing the mold in a sectional metal curbing. Necessity of ramming the pit full of sand before the mold is filled with metal, and then of digging all the sand out again after the casting has been removed, in preparing the pit for the construction of another mold, is not regarded as one of the favorable features of the loam molding method of making castings.

To make the four-blade metal pattern, the original wood pattern of one blade and partial hub is mounted on a spindle

(*Continued on page* 206)



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(*Continued from page* 204)

erected from a suitable bearing in the center of the foundation plate. A thin coating of loam is swept level over a double or triple course of brick work, built up on the plate and conforming approximately to the position and shape of the four blades. The pattern, with a nail point projecting from the lower edge of the blade at any convenient distance from the tip, is revolved to scribe a circle in the loam face. With a long straight edge and square, four marks are made on the circle 90° apart. The marks are checked by a pair of trammels and must be perfectly accurate to insure a balanced wheel.

With the blade located on the first mark, the molder builds up a brick wall to form the drag part of the first section of the mold. Although forming a complete entity in the completed condition, the mold is built up as four units, one to each blade. The wall is built up to the lower face of the pattern and terminates in a row of headers; that is, bricks with the inner ends pointing to the center. The space inside the wall and under the blade is filled loosely with old sand and brick bats, topped by a course of brick and a thickness of loam pressed against the face of the pattern. The wall projects beyond the pattern for the greater part of the distance on the high side to form the parting line and a bearing for the cope. Around the front or tip of the blade, the parting line drops straight down to form a ledge or shoulder, which later acts as a guide in assembling the mold after all parts have been finished and dried. A coating of loam is spread over all bearings and parting areas and smoothed down with the tools.

Lifting Plate Is Sectional

In building the cope, a lifting plate in sections is laid all around the joint. This plate is provided with loops to which long bolts are attached later. Upright pockets or channels are constructed in the wall to facilitate attachment of the bolts. Loose building irons, corresponding to the bars in a cope flask, are set in place with the ends resting on the lifting plates on the joint of the mold. A covering of brick headers bedded in loam is built over all the upper or exposed face of the pattern. The wall on the outside is built up, and the inside space is filled with loose sand and brick bats. The upper surface is scraped off flat and level and a stiff iron plate is bedded in place. Bolts extending from this plate to the lower lifting plates are screwed up tight and then the cope is lifted by the crane and set up on suitable stands on the floor, where minor repairs are effected and where the face is covered with blacking. Later in company with other copes, this particular unit is loaded on high stands on the oven car and dried. The stands support the high side; the lower part rests on the lifting plates.

After the cope has been removed, the pattern is lifted, swung through an arc of 90° and lowered into place in the second

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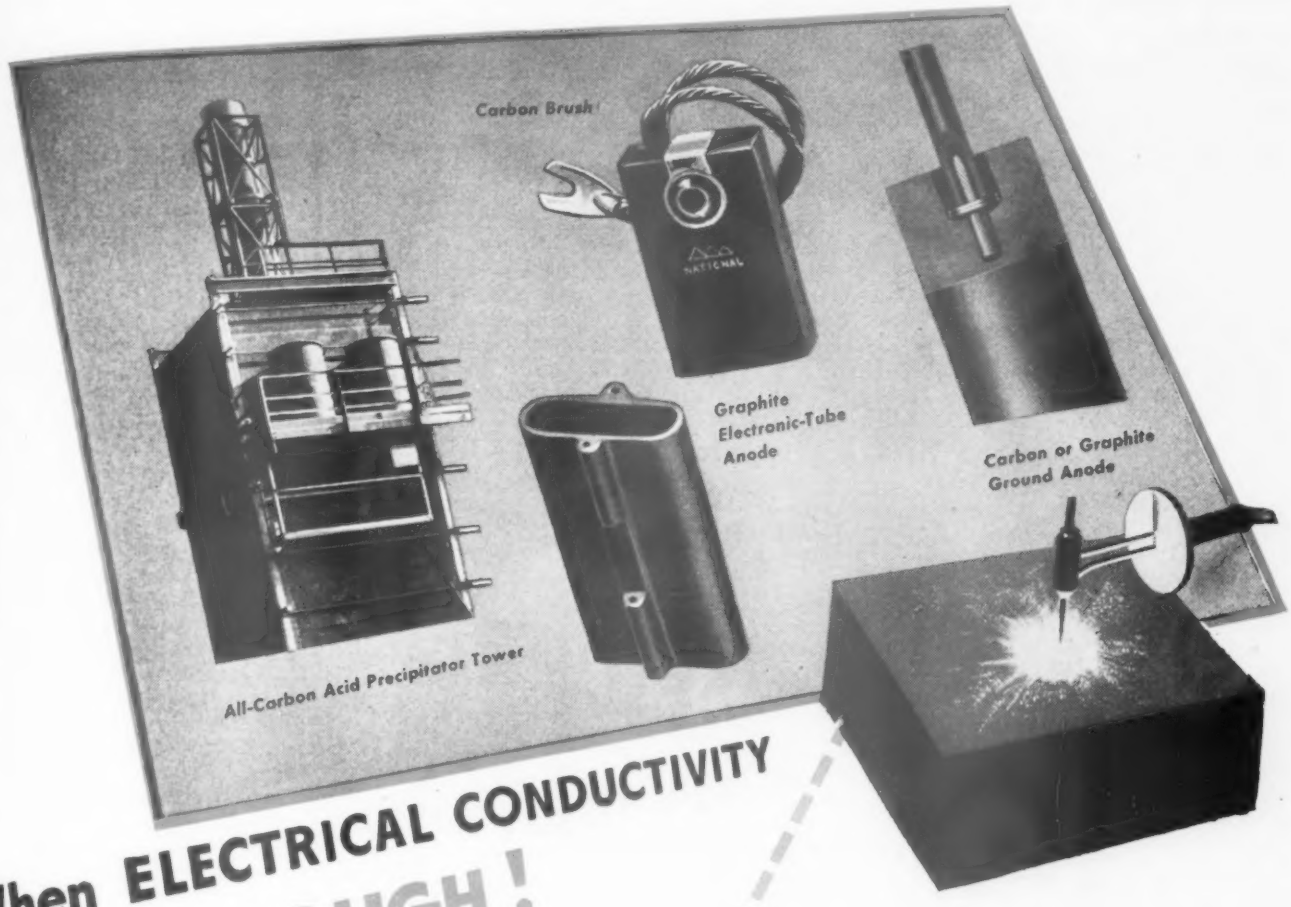

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LET'S GET THE JAP — AND GET IT OVER!

(*Concluded from page 206*)
position, where the foregoing procedure is repeated. The same process is repeated for the third and fourth blades. The runner formed in tiles is laid in the space between two blades and terminates in a gate which delivers metal upward into the bottom of the hub. The sprue, also in tiles, is set up near one side of the pit where sand is rammed around it in the process of assembling the mold.

Where a complete four-blade pattern is available, the preliminary work of laying out the blade positions is not necessary. The pattern is lowered into place and work on the walls commences immediately. Another advantage of the complete pattern is that, if necessary, work may proceed on all four blades simultaneously.

The riser or feeding head on a large propeller, 6 in. larger in diameter than the hub, weighs approximately one-sixth of the casting. The sand mold for the riser is made inside a sheet steel ring or in several small flasks bolted together. The face is black-washed and dried, and then the riser unit is placed over the central or hub opening in the closed mold. Trunnions on diametrically opposite sides are engaged by the crane chains in lifting the propeller casting out of the pit after the mold has been taken apart. The center core, which forms the opening for the propeller shaft and which extends from a print in the bottom of the hub to a point several inches above the top of the sink-head, is provided with two or more extensions on opposite sides, designed to reduce the amount of metal in the hub and thus to some extent reduce shrinkage and contraction strains.

The core is reinforced with long rods and is provided with hooks at the upper end for handling. Properly centered in the mold, it is anchored under one of the binder bars with wedges, which gradually are released to compensate for expansion after the casting has been poured. The stream flowing through the sprue ceases when the metal enters the riser. The operation is timed to draw all the metal out of the pouring basin. When the metal in the sprue has solidified, the riser is filled with fresh, hot metal, poured directly into the open top. The surface is covered with charcoal or other insulating material and additional metal is poured in at intervals so long as the mass remains liquid.

Manganese bronze melted in a 25-ton capacity, oil fired reverberatory furnace conforms to ASTM specification B147-41T, Alloy 7A; U. S. Navy Department Composition Mn-C Specification 49B3c; SAE 43: Copper 56 to 62 per cent, aluminum, tin and manganese maximum 1.50 per cent each; iron maximum 2.00 per cent; lead 0.50 to 1.50 per cent; total other constituents 0.25 per cent; remainder zinc. Physical properties include tensile strength 60,000 to 78,000 psi; yield point 25,000 to 40,000 psi, elongation in 2 in. 15 to 30 per cent; reduction in area 15 to 30 per cent.

(*To be concluded in an early issue*)

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METALLURGY OF IRON AND STEEL

(*Continued from page 91*)
mined initial composition, Ni-Tensyl, and some of the acicular irons. These latter are perhaps the most recent additions to the range of high-duty cast-irons prepared in this manner. The Ni-Tensyl process was described in detail by F. B. Coyle some years ago, and depends upon the effect of adding proportions of nickel and silicon to a molten low-carbon, low-silicon base iron. Such irons are melted in cupolas, air furnaces or electric furnaces, and the low-carbon, low-silicon requirements are secured by the use of steel scrap or low-carbon-refined white irons. Structurally such inoculated irons are fully pearlitic with relatively fine flake graphite, and when cast under ideal conditions are very uniform in properties in varying sections. Such irons are used for many types of engineering castings where high stresses have to be met, or where reduced sections are desired. In some cases where the ductility of cast steel is not

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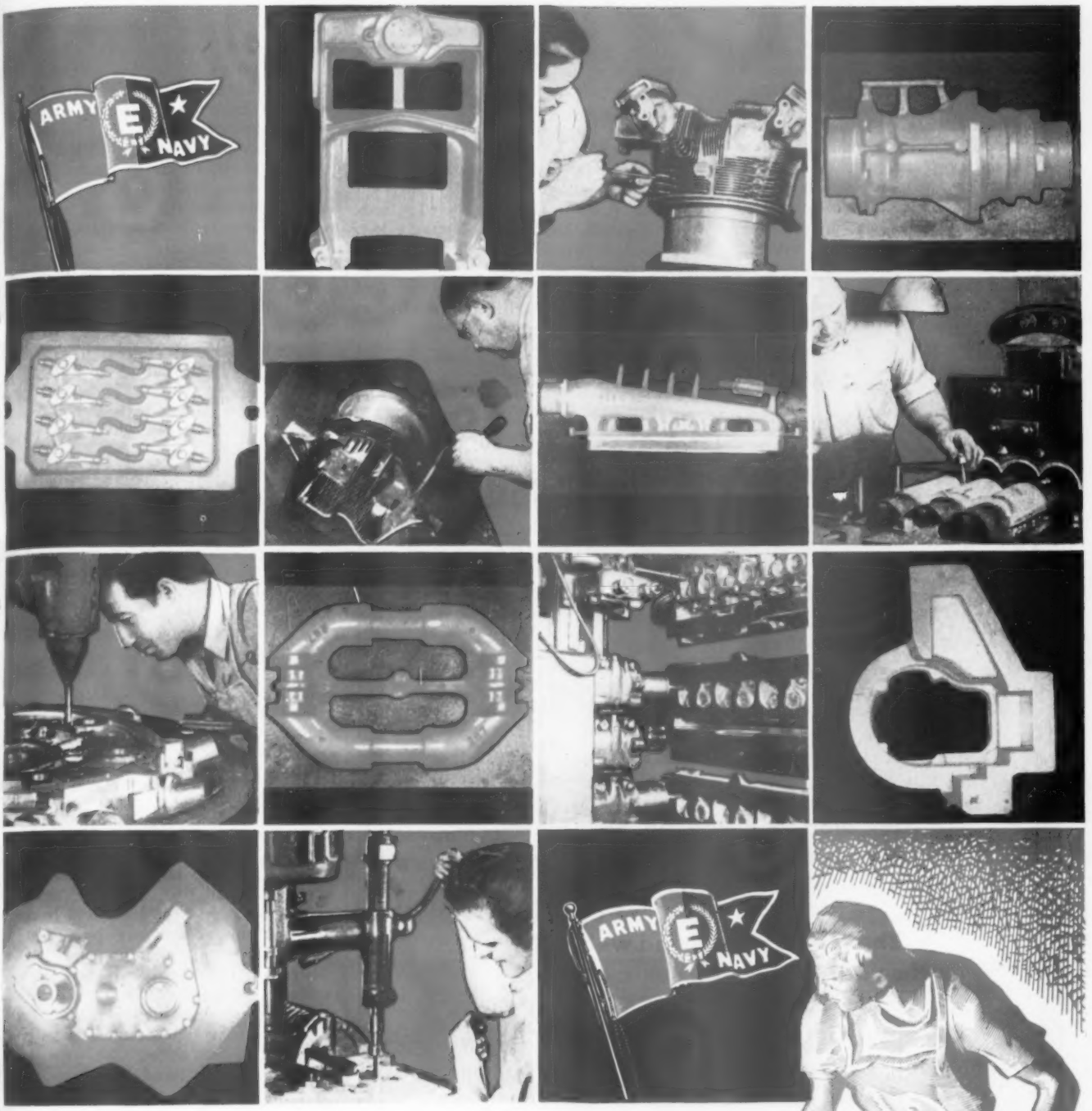

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(*Continued from page* 208)
essential inoculated irons are acting as substitutes.

Acicular Cast Irons. Development of the high-strength cast irons, spoken of as "acicular cast irons," has been referred to previously. Considerable work has been done by United States' investigators Flinn and Reese[4] in the study of the characteristics and properties of these irons. The "acicular structure," in comparison with a typical structure of a high-duty pearlitic iron, is described as consisting of needles of ferrite in an austenitic matrix. A British patent[5] emphasizes the importance of the process used in the production of these irons, the alloying constituents of which are molybdenum and nickel. Use of late additions of silicon plays an important part in their successful production, and the composition casting temperature, pouring time and rate of cooling require to be correlated to ensure satisfactory results.

Melting Technique. In the erection of a number of new plants to deal with expanded output requirements for steel castings, some have been equipped with electric furnaces and others with converter plants. Shortage of hematite iron at the time when new converter plants had to be erected led to a reassessment of the relative importance of the silicon and carbon reactions in the converter process. As a result it was found possible to build side-blown converter plants in such a way that silicon largely could be dispensed with, consequently eliminating hematite from the cupola charges[6]. To achieve this end a furnace had to be introduced between the cupola and converter in which the iron could be brought up to a temperature at which the carbon reaction starts. Plants have been erected on these lines in which rotary mixers installed between the cupolas and converters have enabled the process to be operated as indicated. The mixers serve the additional purpose of enabling the cupolas to be operated independently of fluctuations in demand for steel. The advantages of this process, which may be regarded as a very important development in melting technique for the steel foundry, are summarized in the previously-mentioned paper[6] as follows:

1. Elimination of hematite and ferrosilicon from the cupola charges and the utilization of steel scrap only.
2. Reduced consumption of ferrosilicon in the converter.
3. Appreciable reduction of blowing loss in the converter.
4. Increased flexibility and production through reduction in blowing and slagging time.
5. Longer life of converter linings.
6. Less variation in phosphorus contents and in final steel analysis.
7. More continuity of cupola operation.
8. Reduced quantity of converter slag and easier removal.

Cupola Widely Used

In the melting of metal for the production of gray, white and malleable castings the foundry industry of today has available a wide range of melting furnaces. It is still true, however, that the cupola furnace is the most widely used, and for this reason any proposals for the modification and improvement in its design and operation are of first-rate importance to the industry. Details of experimental work in the design and operation of a basic lined cupola have been made available during the year in a paper by E. S. Renshaw, of the Ford Motor Co.[7]

The possibility of being able to obtain conditions of effective desulphurization has drawn attention to the basic lining of cupolas on many occasions. By the use of a monolithic lining of a stabilized dolomite suitably prepared for ramming, and the availability of a stabilized dolomite cement suitable for patching purposes, the practical difficulties in constructing a basic-lined cupola were overcome. Stabilized dolomite has become available in recent years by the development of a successful method of preventing its hydration in storage.[8] The experimental melts were planned to cover mixtures suitable for gray irons, malleable iron and converter steel, the percentages of steel scrap in the various mixtures being progressively increased from 20 to 100 per cent throughout the series. The results obtained in these ex-

(*Continued on page* 212)

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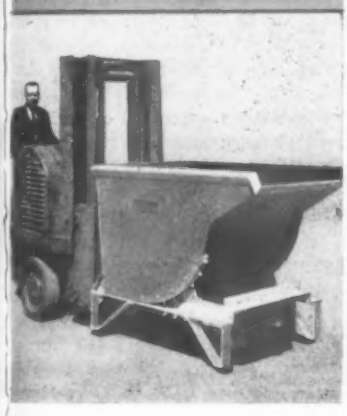

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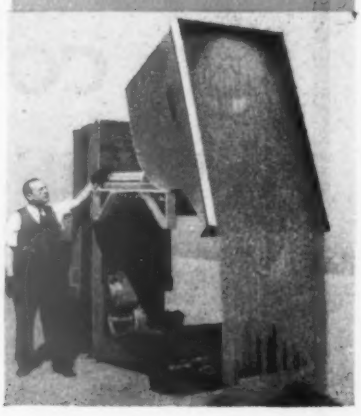

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(*Continued from page* 210)

perimental melts demonstrated the practical character of the basic lining, and that not only could the sulphur pick-up be offset but under suitable conditions of operation the metal could be desulphurized below the charged composition. The process was operated on a full-scale production unit melting low-carbon metal for supply to an electric furnace.

It was stated that the furnace was regularly operated to produce metal with a 50 per cent lower sulphur content than was obtained with an acid-lined furnace and, when required, final figures of between 0.030 and 0.050 per cent sulphur could be obtained. While over 3,000 tons of metal had been melted in this production cupola, all the experience was very promising.

Molding and Casting Technique. No consideration of the developments in molding technique can afford to neglect the important improvements in the applications of risers and feeder heads to the production of sound castings. The proper use of risers or feeder heads presents a problem which continually taxes the ingenuity of the foundrymen. The size, position, type and number vary with every new job, and must be determined before a satisfactory casting can be made. Each different casting is a problem in itself. An aspect of risering sometimes overlooked is that in addition to being essential to obtaining internal soundness they also greatly increase the cost of the finished article. The size of risers may vary from 10 per cent to as much as 70 per cent of the total casting weight. Except for a few basic principles the lay-out of risers on any casting is still very much a matter of "rule of thumb," but considerable attention has been directed to recent improvements in the technique of employing "blind risers." Blind risers may be defined as the use of risers which do not extend through the cope, but are completely surrounded by sand and may be placed at any point within the mold. While this is not a new development, the appreciation of the importance of the atmospheric pressure on the action of blind risers has had an important effect upon the principles embodied in this technique.

Taylor and Rominski, in their paper before the AFA in June, 1942[9], regard a United States Patent (No. 2,205,327) by John Williams, dated June 18, 1940, as the earliest publication dealing with the part played by atmospheric pressure in the technique of blind risers. This subject is too large to be dealt with in the scope of this article, but it is strongly recommended that the paper by Taylor and Rominski, and others which have appeared since, be consulted.

Review Steel Molding Sands

As in the case of metals and alloys changes in sources of supply and restrictions have made necessary a review and study of British resources of steel molding sands. The second report of the Molding Material Subcommittee of the Steel Castings Research Committee in November, 1942[10], and a study of steel molding sands[11] are of special importance, and record considerable information on clay binders and core compounds, and the details of sands and synthetic sand mixtures utilizing home resources and conserving imports to the fullest extent.

The true centrifugal casting process in its application to the production of cylinder liner and sleeve castings, castings for piston ring drums, valve liners and similar applications in both steel alloys and cast iron has been extended considerably during the war years. The development in the application of semi-centrifugal and pressure centrifugal casting processes has also taken place for the production of certain stores, but perhaps not to the same extent as in the United States.

Investment molding technique has been applied to the production of precision castings in the special alloys for turbine, supercharger and similar special parts. Die casting or permanent mold casting of a large variety of stores in gray iron can also be placed in the category of wartime developments in the foundry industry of Great Britain.

Heat Treatment. Considerable attention has been directed toward the heat-treatment of steel castings. Normalizing and annealing of carbon steel castings of both mild and medium carbon steels

(*Continued on page* 214)

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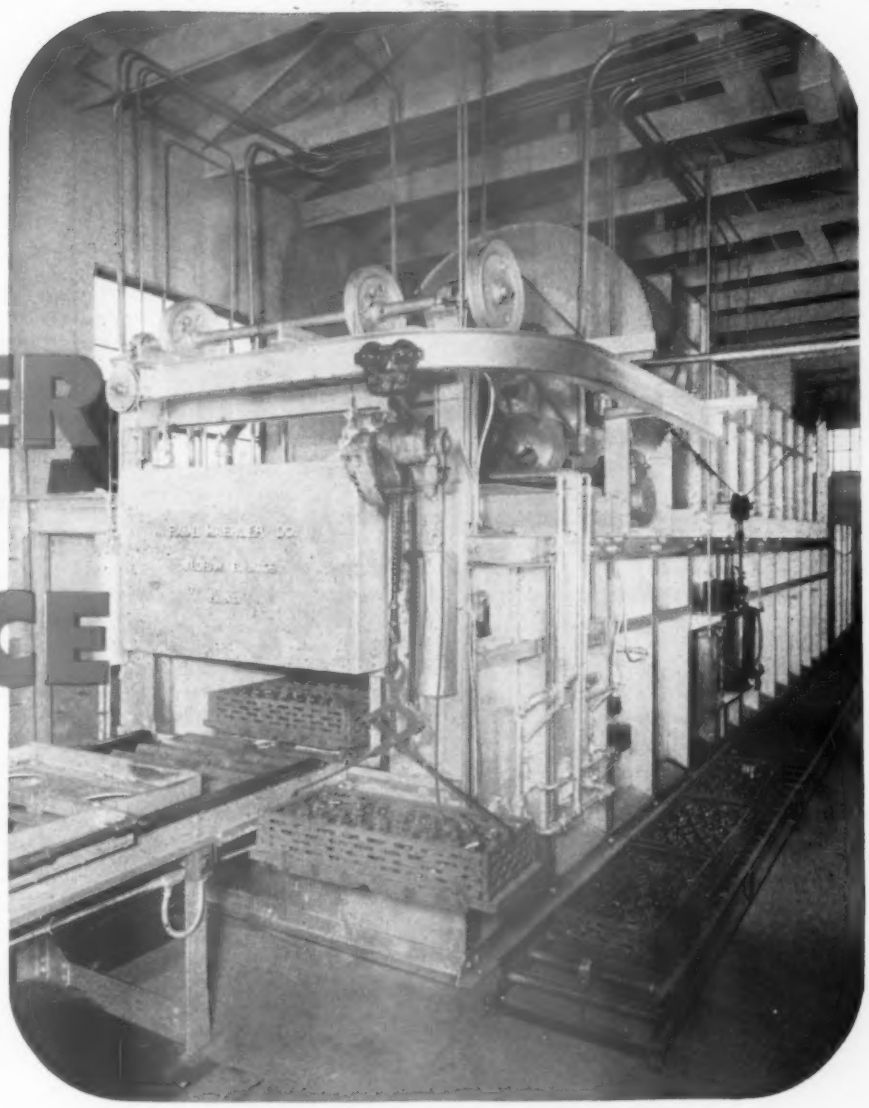

The Maehler air-draw furnace at Chambers, Bering, Quinlan Co. used for annealing gray iron castings. This view shows the loading end of the furnace and the return roller conveyor. Furnace accommodates 38 trays 17" x 36" x 6". As one tray enters, one is pushed out at unloading end of furnace.

This Maehler *built-for-the-job* heat treating furnace maintains temperature uniformity within 2° F.!

ANNEALING gray iron castings contribute much to the life of drills, broaches, lathe tools, etc., as well as reducing retooling costs. When the Chambers, Bering, Quinlan foundry decided to anneal its gray iron castings, Maehler engineers were called in. The photo at the right shows the Maehler roller conveyor-type furnace which was installed. Here are the data and specifications of this efficient unit:

- Capacity of furnace 2,000 lbs. of castings per hour.
- Designed to operate at from 800° F. to 1550° F.—gas fired.
- Working space of furnace—4 ft. wide by 3 ft. 2 in. high by 36 ft. 6 in. long.
- Over-all length—including 7 ft. 6 in. pusher loading station and a 12-ft. cooling chamber 57 ft. 6 in.
- Electric robot control panel completely supervises furnace operation.
- Garden City high-temperature fan driven by a 2-speed motor circulates air at high velocity above normal furnace pressure.
- *Soaking* time of gray iron castings — 1.45 hours at 1200° F

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(*Continued from page* 212)

has been carefully studied and there have been developments in the application of hardening and tempering treatments. As an example, in the case of carbon-manganese type steel castings (0.25 per cent C and 1.5 per cent (Mn) water quenching followed by tempering at 550 to 600 C has been described. The improvement in physical properties imparted by this form of treatment is sufficient to warrant most serious attention. The danger of cracking and warping appears to have been overstressed in the past. A factor of great importance is the temperature to which the castings are allowed to cool before removal from the quench. If the castings are removed at a temperature of about 300 C, the expansion accompanying the transformation takes place more gradually when cooling in air and the hardening effect is not decreased. It is advisable to begin heating to the tempering temperatures before the castings have fallen to room temperatures.

Hyper-eutectoid steels of the high carbon silicon type (1 per cent C, 1 per cent Si and 0.4 per cent Mn) have been used and developed extensively. Very useful properties are developed in this type of steel by a spherodizing anneal. Normalizing this material in the as-cast condition at well above the upper change point and with slow cooling will eliminate the boundaries of the hyper-eutectoid cementite giving a coarse pearlite in which excess cementite is distributed at random. Fairly rapid cooling in air blast gives a much finer pearlite in which the hyper-euctectoid cementite is again concentrated in boundaries as in the as-cast state, but in a much finer form. Provided normalizing is carried out well above the upper change point and cooling to 800 C is not less than 1 to 2 C per minute—there is no appreciable tendency to the production of temper carbon unless the silicon is above 1 per cent. Normalizing alone does not appreciably improve the mechanical properties, and rapid cooling in air blast refines the structure but leaves the hardness and other properties almost identical with the as-cast state. Maximum ductility is obtainable by the spherodizing treatment involving annealing at 780 to 800 C for 3 to 4 hours followed by slow cooling not exceeding 40 C per hour.

Improve Wearing Properties

The wearing properties and resistance to heavy loads of whiteheart malleable cast iron can be greatly improved by suitable hardening and in some cases a subsequent simple tempering operation. For this type of treatment thoroughly annealed castings are essential before carrying out the hardening operation, as under annealing is liable to brittleness on quenching. This treatment was applied to track link castings in whiteheart malleable. Earlier types of links received a further treatment after the malleablizing operation, namely, a cyanide hardening, producing a fairly hard surface of about 0.015 in. thickness with a toughened core. This operation was discontinued in favor of a straightforward oil hardening process, the parts being heated throughout the section as quickly as possible in salt bath furnaces to 780 C followed by quenching in oil. The range of physical and mechanical properties obtainable with whiteheart malleable revealed in the work done in this field show very clearly the great possibilities for the use of heat treated whiteheart malleable castings.

In the field of gray iron castings the use of heat treatment operations by hardening and tempering in the production of high duty iron castings has been extended and considerably explored. The application of subzero temperature treatments to develop to the full the properties of austenitic iron castings has proved of considerable importance in quite a number of cases. In a like manner the development of the full characteristics of martensitic and acicular irons by low temperature heat treatments has been practiced and developed in quite a number of foundries.

Inspection and Testing Procedure. Perhaps the most important of the developments in inspection and testing procedure are those devoted to the determination of the soundness and freedom from internal defects. In this direction the ap-

(*Continued on page* 217)

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of TRIMMING FORMED PARTS
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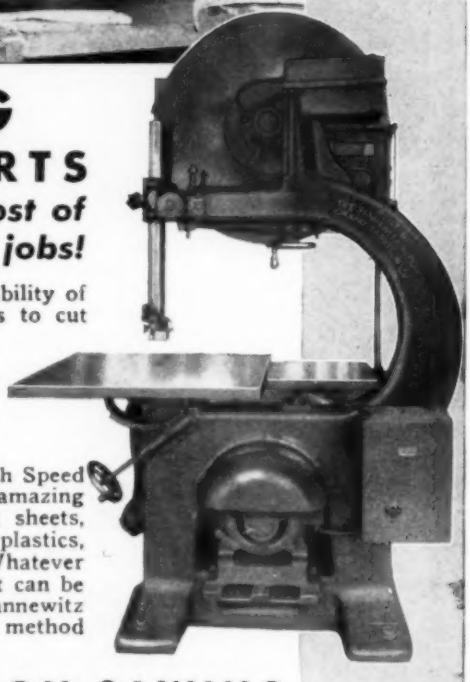

The negligible down-drag and the ability of Tannewitz High Speed Band Saws to cut sheet metal from 90° to near 0 or 135° at tremendous speed make these machines ideal for trimming. Cuts can be made with perfect safety without using a rest of any kind.

Friction sawing with Tannewitz High Speed Band Saws also results in perfectly amazing time savings in the cutting of flat sheets, soft or hardened steels, armor plate, plastics, glass and many other materials. Whatever your cutting problem, chances are it can be done better and faster with Tannewitz Band Saws. Investigate this "Super" method of cutting.

FRICTION SAWING with Tannewitz HIGH SPEED BAND SAWS

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THE TANNEWITZ WORKS GRAND RAPIDS 4, MICHIGAN

Mexaloy Super Refractory Saves Linings and Equipment

Tough, non-fusible protective lining for ladles, spouts, runners and cupolas

Mexaloy is the ideal material for protecting refractory linings of cupolas, ladles, runners and spouts in both foundries and steel plants. Mexaloy makes the body containing it highly resistant to sudden, violent temperature changes and thus avoids spalling and cracking of the refractory. Practically infusible, it will not melt or change its character under the action of molten metal. Neutral and chemically inert, Mexaloy's presence insures resistance to fluxing and corrosive action by molten metals and slags. It provides a low-friction, surface which allows no foreign body adherence.

Mexaloy is extremely easy to apply. Mixed with clay, ground fire brick and water according to a simple formula, the resulting mixture is easily applied by tamping. Linings containing Mexaloy last longer. For example, in the spouts of open Hearth furnaces where the usual loom layer has to be replaced after every one or two heats Mexaloy linings invariably last more than 10 heats—sometimes as many as 30. In Foundry cupolas Mexaloy linings last longer and improve metal quality.

To greatly reduce "shut downs" in your steel plant or foundry due to refractory replacements, it will pay you to use Mexaloy. Write today for further information.

Mexaloy

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HELP CONTROL PRODUCTION COST of QUALITY STEELS WITH SIMANAL

20% SILICON • 20% MANGANESE
20% ALUMINUM

Of all deoxidizers for molten steel Simanal is the most favorable in every respect when considering number, composition, size and arrangement of non-metallic inclusions remaining after deoxidation. And that means cutting steel processing costs, for Simanal results in lessening man hours, increases yield and provides a better ingot surface.

Your own test application of Simanal will prove its merits as it has for others. Helpful technical-assistance is also always available from the Ohio Ferro-Alloys staff.

THESE ADVANTAGES ADD UP TO COST-SAVING QUALITY CONTROL!

PRODUCTION OF CLEANER STEELS
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CONTROL OF ALUMINA, SILICA, AND ALUMINA SILICATE INCLUSIONS
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PRODUCES GLOBULAR INCLUSIONS
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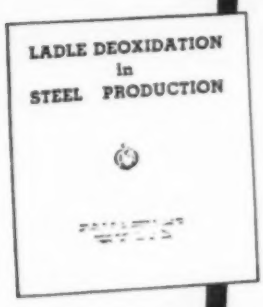

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BRIQUETS

SILICON, MANGANESE, CHROME

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Chicago Detroit Pittsburgh San Francisco Tacoma

(*Continued from page* 214)

plication of x-ray and radiographic technique has made the greatest strides, and these methods have been employed extensively on the examination of castings. Other methods include electromagnetic crack detection, magnetic comparison methods and the application of sonics.

The demand on the chemical laboratories for analyses has been increased enormously due not only to increase in production, but also to the increase in number of determinations required arising from the use of secondary metals and the importance of contamination arising from residual elements. Application of the industrial spectrograph to the routine analysis in addition to qualitative selection has done much to relieve this burden in the steelworks and nonferrous laboratories. The most recent application of this technique is to the determination of silicon and the metallic elements in cast iron. In addition, the adoption of absorptiometer, Strohlein carbon and combustion sulphur methods has reinforced the spectrograph in dealing with the problems of routine chemical analysis.

Mechanical Testing Important

In the field of mechanical testing as applied to cast iron the importance of the impact test has been recognized for a long time. A Subcommittee of the Technical Advisory Panel to the Directors for Iron Castings of the Ministry of Supply has been engaged for a considerable time in the study of existing methods developed for the impact testing of cast iron and has carried out a great deal of experimental work in co-operation with industry. While the subcommittee is not yet in a position to recommend the standardization and specification of an impact test, they are able as a result of their work to recommend a procedure to be adopted in making the impact test of cast iron.

After considering all available methods the subcommittee felt that the most generally useful test would be a single blow test, and carried out in the Izod impact test machine owing to the availability of this type of equipment in many engineering works, and its acceptance as a standard method of test on other materials. A special form of test-bar is necessary in order to give a wide spread of results with adequate differentiation between different classes of cast iron. The 10-mm square bar as used for the Izod test for steel is clearly unsuitable, as the test figures generally lie between ½ and 4 ft-lb. With the test proposed, the range of results is widened to between 5 and 70 ft-lb for modern gray iron castings. It must be emphasized at the outset that the test is designed primarily for plain and alloyed gray cast iron, and is not suitable either for malleable cast iron or for the special highly alloyed irons of the austenitic types.

The procedure recommended for the impact test is as follows:—

1. The impact test should be carried out in the standard 120 ft-lb Izod impact machine.

2. The form of test-piece to be a 0.798-in. diameter plain bar, with no notch or groove. A separate test piece to be employed for each test.

3. The test piece to be held in grips or dies. This is, with minor modifications, in line with the practice developed and recommended by the British Cast Iron Research Association following their own study of this problem.

4. A striking height of 22mm to be employed, this height to be measured from the top of the rear grip.

5. Special attention must be given to the fit of the grips in the machine, and the fit of the specimens in the grips. This calls for care in finishing the specimen accurately to diameter.

6. Wherever possible, at least three tests on any one material should be taken and averaged.

7. Test pieces may conveniently be machined from the 1.2-in. diameter by 21 in. long transverse test bar or, alternatively, from the broken halves of this bar after transverse testing. In taking test pieces, clearly the top end of vertically cast bars should, if possible, be avoided.

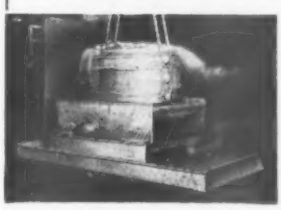
References

1. Report by the Cast Iron Subcommittee of the Institute of British Foundrymen on meeting the raw materials supply position in gray iron foundries, *Foundry Trade Journal*, Aug. 12, 1943, et. seq.

2. "Ladle Metallurgy," J. H. Williams, *Foundry Trade Journal*, Dec. 17, 1942.

3. Braidwood, *Journal*, Institute of British

THIS IS IT . . . the way to safeguard employee health, protect valuable equipment . . . get more work done . . . is to control those storms of smoke, dust, fumes with a Sturtevant Foundry Shake out System.



Picture your foundry shake-out room as being free from choking clouds of smoke, dust and fumes. It can be, you know . . . with a Sturtevant Foundry Shake-Out System on the job.

You'll find your men can get more work done. Adjacent equipment will work more efficiently, for longer periods with less maintenance. You remove a serious health hazard and improve your insurance risk. In addition, your cleaning costs are cut to the bone. Others are now enjoying these advantages. Others have found their investment soon repaid.

Sturtevant Foundry Shake-Out Systems are designed and built by engineers thoroughly familiar with foundry practice and problems. The result:—greater suction on a minimum of power; an installation that's tailor-made to fit your particular needs; and competent, local engineering service. Why not call in a Sturtevant Engineer and get the first-hand facts?

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Puts Air to Work

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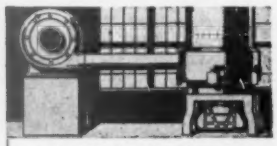
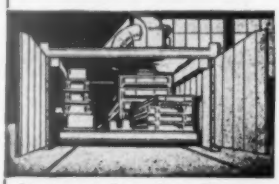
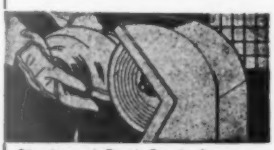


Sturtevant Cupola Blowers—assure smooth, constant pressure supply of air. Compact, simple, sturdy construction; sizes and types for all conditions.

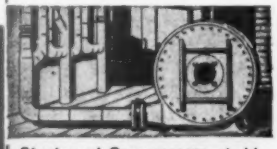


Sturtevant Core Oven Fans—handle dirty dust-laden air with no loss in efficiency. Shafts cooled by special "heat-slinger."



Sturtevant Dust Control—pioneer experience in engineered systems for collecting dust from snagging, tumbling and sand-blasting operations.

Sturtevant Fume Control—efficient tailor-made systems for production foundries or low-operating-cost equipment for jobbing shops.



Sturtevant Compressors—hold air pressure constant, in supplying blast to oil or coke burners. Lifetime efficiency, minimum maintenance; worthwhile power savings.

Foundrymen, 1941-42.
4. "Structural Analysis of Gray Cast Iron," Flinn and Reese, THE FOUNDRY, January, 1941.
5. British Patent No. 545,102, Mond Nickel Co.
6. P. C. Fassotte, *Journal*, Institute of British Foundrymen, No. 1, 1944.
7. "Basic Cupola Process for Desulphurization," E. S. Renshaw, *Foundry Trade Journal*, June 24, 1943.
8. "Dolomite Bricks for Use in Steel Works," Swinden and Chesters, Iron & Steel Institute, 1941.
9. "Utilizing Atmospheric Pressure in Making Steel Castings," Taylor and Rominski, *Foundry Trade Journal*, Oct. 15, 1942 et. seq.
10. Second report, Molding Materials Subcommittee, Iron & Steel Institute, November, 1942.
11. "British Resources of Steel Molding Sands," Davis and Rees, Iron & Steel Institute, June, 1943.

FOUNDRY RESEARCH AT BATTELLE

(*Continued from page* 97)

in ferrous castings, malleable castings for military applications, converter cast steel, pearlitic malleable iron, phosphorus in steel, inhibitors for magnesium casting, etc.

Foundry laboratory at Battelle occupies the lower portion of one building with a total floor area of 60 x 300 ft. Melting equipment includes three cupolas, four high-frequency electric induction units and direct arc, indirect arc and several crucible type furnaces. Cupolas are equipped with gas sampling tubes at various levels, air-weighing blast equipment, and air-conditioning equipment which permit observation of cupola performance under various operating conditions. Other foundry equipment includes sand mulling and conditioning machines, casting cleaning apparatus, core ovens, heat treating furnaces, and centrifugal casting machines. Through facilities available in the woodworking and machine shops, patterns, permanent molds and other equipment and apparatus can be supplied to meet specific requirements.

Thus, it may be seen that the foundry is equipped to make ferrous and nonferrous castings by the sand, permanent mold, centrifugal and precision processes, and through co-operation of other divisions and service departments an accurate study may be made of the castings relative to quality, proper production procedure, etc. Some of the results obtained for various sponsors include changes in foundry practice to eliminate casting defects, improvement in quality, increase in yield of good castings, development of new foundry alloys and new addition agents. An important field of work of the foundry division in recent years has been the study of the effects of gases on the properties of metals and alloys, and of methods of controlling gas contents to produce superior castings. In addition it has engaged in research on allied foundry problems such as mold design, construction and materials, as well as molding and core sands, core binders and casting practices.

Staffs and Facilities Available

Mention has been made of co-operating divisions and service departments whose staffs and facilities are available to the foundry division for conducting work or in a consulting capacity as required. Those include chemical and mechanical testing laboratories for work in such fields, ceramic division for refractories, fuel division for coke and other fuels, sand laboratories, spectrographic and x-ray laboratories, high temperature laboratory and metallographic laboratory, in addition to others to which reference has been made.

Established July 1, 1929, Battelle Memorial Institute was founded by Gordon Battelle, the only son of Col. John G. Battelle, an Ohio industrialist who had extensive interests in coal, iron and steel. The founder left the bulk of his estate to the institute and that amount later was increased through a bequest by his mother, Mrs. John G. Battelle. Gordon Battelle's will provided for the building and endowment of an institute "for the purpose of education and creative and research work and the making of discoveries and inventions for industry."

Endowment of the institute has yielded sufficient income to provide buildings and equipment for continued growth and also to support a continuing program of

WORKING WITH ALUMINUM?

Typical layout for die casting, showing compact 20 KW Ajax-Tama-Wyatt furnace in position. Unit comes with complete control cubicle, as shown.

INVESTIGATE THIS UNIQUE HOLDING FURNACE for IMPROVED OPERATIONS and LOWERED COSTS!

INDUCTION FURNACES MEAN A MODERN PLANT..

In addition to the holding furnace here described, small, compact, twin-coil melting furnaces are likewise available for continuous production.

Rolling mills and foundries using Ajax-Tama-Wyatt units have *consistently* developed the highest physical properties in their aluminum products . . . with decreased gas absorption, absence of all segregation, and elimination of oxide inclusions and hard spots . . .

Clean-cut temperature control, great ease and simplicity of handling are operating characteristics. Ajax induction furnaces give you a modern plant, a cooler foundry, a better product. Significantly, too, they have been known to pay for themselves within less than six months. *Write for latest TW catalogs describing both Ajax holding and melting furnaces for aluminum!*

ADVANTAGES

- Every element of uncertainty is removed from holding furnace procedure
- Automatic, positive temperature control to within 5 degrees
- No segregation, iron pickup, or contamination — automatic stirring
- Always ready to operate — no heating up or waiting periods
- Pays for itself quickly by doing away with pot or crucible replacements
- Maintenance costs so low as to be virtually negligible
- Low operating costs — only 12 KW for holding continuously up to 400 lb.; 8 KW when covered on week ends
- Greatly improved overall foundry conditions inherent in induction melting

AJAX AJAX ENGINEERING CORPORATION • BOX 1418 • TRENTON 7 • N. J.
TAMA-WYATT INDUCTION MELTING FURNACE

AJAX METAL COMPANY, Non-Ferrous Ingot Metals and Alloys for Foundry Use
AJAX ELECTROTHERMIC CORP., Ajax-Northrup High Frequency Induction Furnaces
AJAX ELECTRIC CO., INC., The Ajax-Hultgren Electric Salt Bath Furnace
AJAX ELECTRIC FURNACE CORP., Ajax-Wyatt Induction Furnaces for Melting

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fundamental research. To carry out the will of the founder relative to "making of discoveries and inventions for industry," the institute provided a research-for-industry plant whereby it supplies the plant, equipment and personnel, and the sponsor of the research—which may be a company or group—pays for the time of the personnel assigned to the enterprise and out-of-pocket costs. Amount of money annually invested in sponsored research projects in 1933 was $80,000, and is estimated to have reached $2,500,000 in 1944. In addition, Battelle Memorial Institute annually contributes large sums from its endowment income to provide plant and equipment for the ever increasing needs of that program.

Facilities of the institute for carrying on a technological research in metallurgy, fuels, ceramics, chemistry and physics mainly are housed in two large three-story buildings which provide 240,000 square feet of floor space. However, these buildings are badly overcrowded, necessitating the shifting of some work to three floors of a building in another part of Columbus. Just recently, building priorities were secured for a third structure on a plot of land adjoining the main buildings, and erection has commenced.

Operates on Basic Philosophy

Staff at Battelle for carrying on its various activities is approximately 740 and investment in buildings and equipment about $2,500,000. It is interesting to note that these figures are just about the same as those for the research facilities of one of the leading automotive companies. Basic philosophy of the institute is that industrial research requires a keen appreciation of commercial objectives, and to accentuate that phase more sharply it is organized into a series of research divisions comparable to various departments of an industrial firm. The divisions are supplemented by a number of service groups or departments.

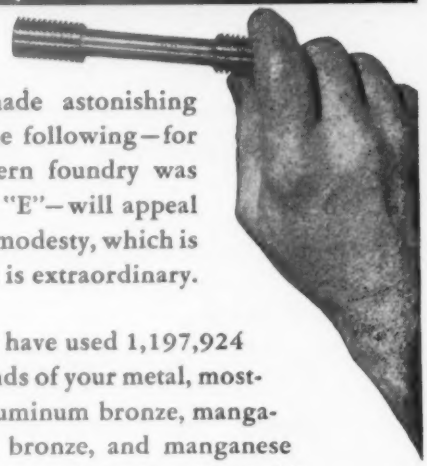
Divisions include those for process metallurgy; physical metallurgy; ferrous and nonferrous metallurgy; raw material processing and ore beneficiation; technology of coal; gas and oil; industrial physics; organic, inorganic and electro chemistry, and ceramics. Service departments include laboratories for mechanical testing, chemical analysis, spectrograph analysis, photography, radiography, and electron diffraction study. In addition to these, Battelle has available to the various divisions a well equipped library containing over 12,000 volumes and subscribing to nearly 400 technical journals and magazines; also fully equipped machine and woodworking shops, an instrument department, and other services.

Each operating division is under the direction of a research supervisor who has had academic training and industrial experiences in his special fields. He is aided by one or more assistant supervisors, and the supervisory group directs a staff of research engineers, assistants and technicians. In addition, Battelle maintains a staff of technical advisors available to all members of the staff and to sponsors. Those men act as consultants, review and co-ordinate work in progress and aid in organization and planning of new projects.

In development of research projects the institute's organization is employed in an extremely flexible manner. Each project is assigned to the proper operating division, and the supervisor is made directly responsible for progress of the work. Individuals within the division are assigned to the project and are expected to utilize the talents of any member of the institute's staff who may have any knowledge relating to the problem. Frequently three or four divisions co-operate for the solution of a problem with the result that the research is the product of the group rather than of one or two individuals.

It is estimated that in an average year over 7000 representatives of industry and business visit Battelle Memorial Institute for the purposes of consultation. They include executives, bankers, research directors, production and operating engineers, managerial and technical consultants. Their firms embrace those engaged in manufacture of iron, steel and other metals and alloys, chemicals, ceramic products, paper, stone and glass, or in processing of ores, coal and petroleum;

REJECTS BELOW 1/4 OF 1%!
A Highly Expert Foundryman reports to AJAX



Nonferrous founders have made astonishing records in the last 3 years. The following—for which this representative eastern foundry was thrice awarded the Army-Navy "E"—will appeal to all foundrymen because of its modesty, which is typical, though the achievement is extraordinary.

Send for booklet
"INGOT METALS OF TODAY"

16 STANDARD INGOT METALS BY AJAX

Ajax Tombasil
Ajax Plastic Bronze
Ajax Anti-Acid Bronze
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Ajax Golden Glow Yellow Brass
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Ajax Phosphor Copper
Ajax Silicon Copper
Ajax Nickel Alloys
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NOTE

•"Proper Melting Decreases Foundry Losses," contains interesting data. Also, the booklet, "Nonferrous Ingot Metals of Today." Write for both of these. They are free.

"We have used 1,197,924 pounds of your metal, mostly aluminum bronze, manganese bronze, and manganese aluminum bronze. All of this has gone into Army and Navy material. It has been subjected to severe tests, both chemical and physical, in castings weighing from ½ to 750 lb. each. A lot of this had to stand a hydrostatic test of 7,700 lb. On this production, we feel it safe to say that our rejects have been less than ¼ of 1% due first, to your fine quality of metal, and second, to our good luck."

We are always gratified to receive letters of this character, and take pleasure in placing it among many similar ones received during our 65 years in the metal business.

AJAX NON-FERROUS INGOT METALS AND ALLOYS FOR FOUNDRIES
ESTABLISHED 1880 METAL COMPANY • PHILADELPHIA
AJAX ELECTRIC FURNACE CORP., Ajax-Wyatt Induction Furnaces for Melting
AJAX ELECTROTHERMIC CORP., Ajax-Northrup High Frequency Induction Furnaces
AJAX ELECTRIC CO., INC. The Ajax-Hultgren Electric Salt Bath Furnace
AJAX ENGINEERING CORP., Ajax-Tama-Wyatt Aluminum Melting Induction Furnaces
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and represent fabrication, transportation, mining and other industries, or the field of finance.

Problems brought by those individuals are many and diverse and may involve selection of materials, development of new products and processes, uses of waste products, and economic and marketing problems. At present, the institute is assisting more than 150 companies and industrial groups to solve problems in various phases of their operations. They include large firms with specialized research staffs of their own, small businesses unable to afford the expense of a research laboratory, and firms in various industries which have grouped themselves together to solve problems common to all.

Like every other patriotic organization Battelle Memorial Institute has contributed its utmost to the winning of the war. In addition to study of problems which specific companies have encountered in war production, it has engaged in extensive research work for various governmental bodies as already noted. Such work embraced such projects as substitutes for strategic materials, methods of producing critical materials from unused domestic sources, developments of new alloys and treating processes, and numerous others which are incorporated in aircraft, tanks, guns, ships, ammunition and other military materiel.

For its outstanding contributions to ordnance progress during the course of the war Battelle received the Ordnance Distinguished Service Award from the War Department on July 20, 1944. In making the citation Maj. Gen. L. H. Campbell, Jr. wrote:

"It is my pleasure as Chief of Ordnance of the Army to tell you—that I am most grateful for the outstanding contributions the Battelle Memorial Institute has made to Ordnance progress in this war. The degree of that progress is best shown by the success of our fighting forces in all theaters of operations.

"To attest the appreciation of the Department for the splendid services of your Institute, I wish to present to the Institute the Ordnance Service Award—in recognition of scientific and engineering achievement."

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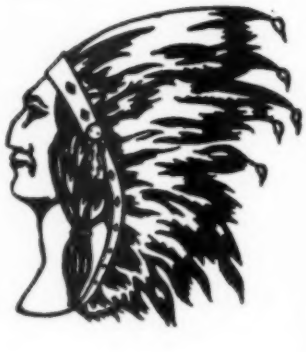
- A laboratory controlled, first quality product especially "tailored" for Foundry Use
- Offered by a pioneer producer



- Sold with a complete technical service . . . available on request . . . fitted to your individual needs
- Stocks located in principal cities

F. E. SCHUNDLER & CO., INC.
520 RAILROAD STREET • JOLIET, ILLINOIS
SCHUNDLER
BENTONITE

EFFECTIVE SHRINK-BOB RISERS

(*Continued from page* 86)

since it can be as large as desired, provided it can be kept choked readily by the iron pourer.

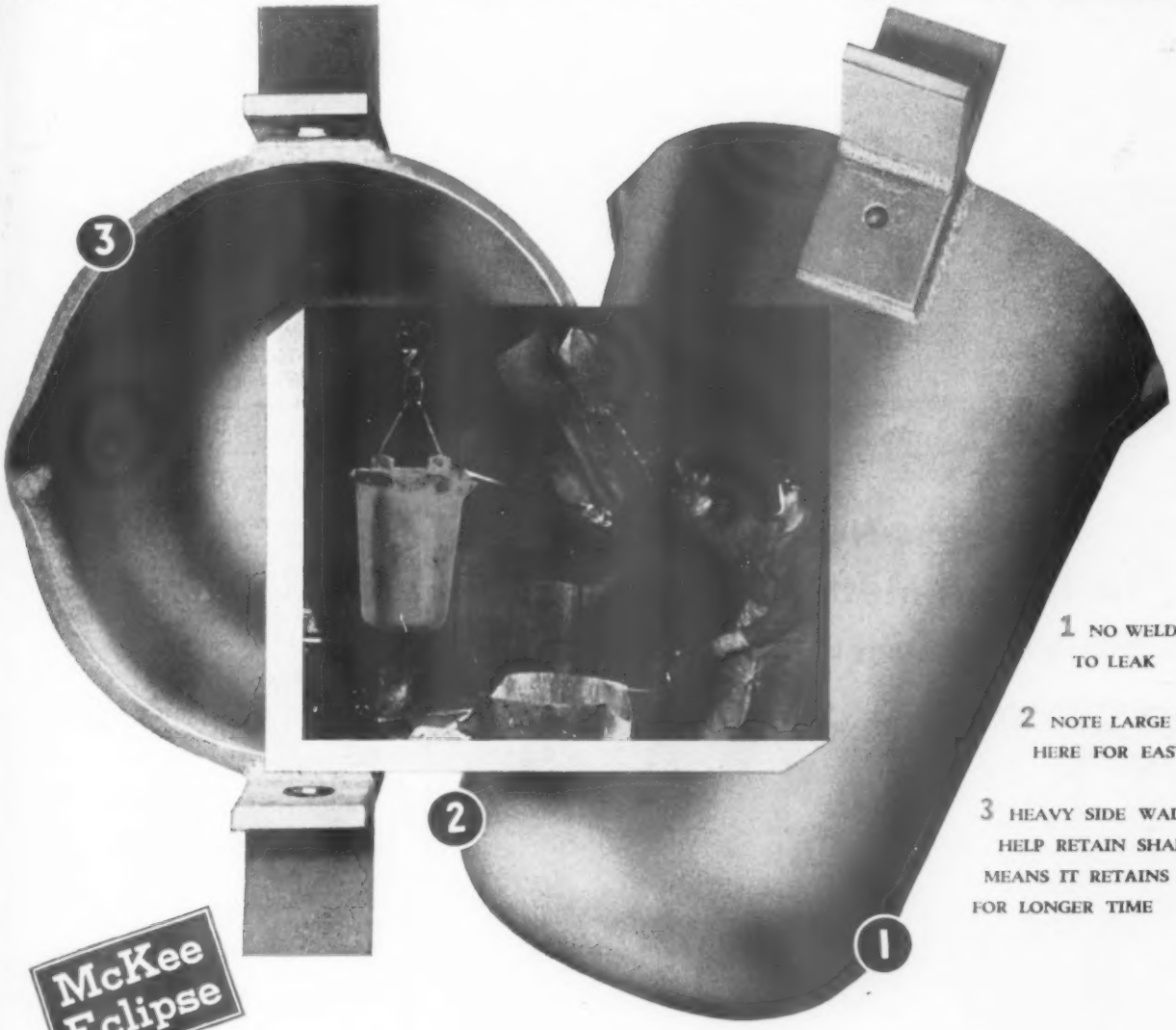
The gating system guarantees that there is no danger from any jet effect producing a washing of the sand in the mold cavity, since the gate goes directly into the shrink bob and not into the casting. As a matter of fact, one of the distinct advantages of the shrink-bob riser system is the absence of any washing effect due to jetting or gushing of the metal entering the mold. This design permits gating directly against the core or an internal mold surface which would be impossible with an ordinary gating system. Apparently, all the impinging, or jetting effect, of the metal is taken up in the shrink-bob riser, and a smooth, soft flow from the riser into the casting is always obtained.

Another of the marked advantages of this system of gating is the substantial savings which may be made in the cleaning room. The small neck, which is an important feature of this system, and the fact that there is only one riser on any one casting, makes the cleaning of the casting a very simple process. Even very large castings, with large risers, are handled by removing the riser with a sledge hammer and grinding off the small stub which remains. When the time necessary for this method of cleaning is compared with the time involved in chipping off large and numerous risers necessary with other gating systems, it can readily be realized that the saving in cleaning room costs alone is sufficient reason for the adaption of this system to as many castings as possible.

The principal advantage of the shrink-bob riser is that it accomplishes the ob-

(*Continued on page* 222)

One Piece Crucibles: "No Welds"!



1 NO WELD HERE TO LEAK

2 NOTE LARGE RADIUS HERE FOR EASY CLEANING

3 HEAVY SIDE WALL TO HELP RETAIN SHAPE, WHICH MEANS IT RETAINS CAPACITY FOR LONGER TIME

McKee Eclipse

Seamless Pressed Steel Magnesium Crucibles

• IN THE MELTING of magnesium alloys, these Eclipse Pressed Steel Crucibles are being more and more extensively used. Because foundry men have discovered that with seamless firebox steel construction, the possibility of crucible failure through defective welding is eliminated completely. Crucibles furnished in magnesium capacities of 60 to 2,000 lbs. For both superheating and tilting furnaces. Write for details. Eclipse Fuel Engineering Company, 725 So. Main, Rockford, Illinois.

Representatives in all principal cities

McKee Eclipse

ECLIPSE FUEL ENGINEERING COMPANY

Gas Combustion Equipment, Industrial Gas Furnaces, Steam Boilers and Dowtherm Generators, Centrifugal Blowers and Heat Treating Containers.

If it's for Gas—buy Eclipse

(*Continued from page 220*)

jective of reducing shrinkage difficulties to a minimum and permits the production of sound castings of intricate design, particularly in high-strength irons and low-carbon irons, which normally are subject to excessive shrinkage difficulties. Figs. 2 to 10 illustrate some commercial castings being produced at Buffalo Division of the Worthington Pump & Machinery Corp., in which this system is utilized to advantage. The castings shown are merely representative of the wide range of sizes and types covered by this system at the present time.

The castings shown in Fig. 2 weigh 2380 lb each and are poured two in a mold as illustrated. They are 60 in. long and 12 in. in diameter. Similar castings range from 3 in. in diameter to 14 in. in diameter. The castings were previously made on end, and the top portion removed to eliminate porosity. With the present system of gating, the castings are completely sound throughout their entire length, and the cleaning costs are reduced to an absolute minimum.

An exhaust valve casing, shown in Fig. 3 and weighing 93 lb, must be free from leakage after machining. Previous methods of gating failed to eliminate difficulty with porosity in the heavy boss section where the present gate is applied.

The method of pouring eight castings with one down sprue and two shrink-bob risers to obtain soundness in 20-lb sheave bushings is illustrated in Fig. 6. Previous gating systems permitted porosity after machining the center hole of the bushing. The elimination of heavy risers at the top of each casting made substantial savings in the cleaning room.

Two different castings, which previously had proved troublesome because of the disclosure of shrinkage after machining, are shown in Figs. 7A and 7B. The casting on the left previously was made with a large riser on the top of the heavy section, which required 15 minutes' cleaning time for each 71-lb casting. The casting on the right weighs 41 lb and requires freedom from shrinkage at the junction of the riser and the casting.

Two castings previously scrapped because of leakage difficulty are included in Figs. 8A and 8B. The casting at the bottom weighs 29 lb and must be leakproof after boring out the center hole. The casting at the top weighs 40 lb and is troublesome at the junction of the flange and the heavy section.

Eliminates Use of Chills

Figs. 9A and 9B depict two different applications of the shrink-bob riser to eliminate porosity in the bored hole at the very center of heavy sections. The valve cover at the left weighs 42 lb and previously could not be produced with sufficient density to ensure machining of the solid, smooth thread in the center boss without the use of chills. The group of castings on the right are small sheave bushings weighing 4 lb each, made six in a flask. These could have been made eight in a mold, as far as the gate is concerned, but the flask size permits only six.

Two methods of pouring groups of castings of small or medium size are indicated in Fig. 10. The group on the left contains four 8-lb bushings poured with one sprue and two risers, while the ones on the right include two 20-lb castings using one riser.

If the principles of the shrink-bob riser are properly applied, a wide range of castings may be produced in a variety of types of iron, including the low-carbon, high-strength iron, without difficulty and with substantial savings in cleaning and handling costs. However, to make this system as widely applicable as possible and to illustrate the effect of changes in the various portions of the gating system, the accompanying table of defects and their remedies is included. (See page 86).

An illustration from the table of Defect No. 4 and its remedy is shown in Fig. 11. These castings are small "sticks" 6 in. in diameter and 18 in. long. They are poured the same way as the larger sticks shown in Fig. 2. The castings weigh 150 lb each and are poured two in a mold. The casting on the right was gated with a 3-in. shrink

(*Concluded on page 224*)

New Shankless Roll-Forged Drill is Faster, Tougher, More Economical

Developed by Ford for wartime uses—available now to industry in general. "More holes at less cost," is the claim for this ingenious new Shankless high speed drill—made in two parts—the drill itself, and a removable taper shank, known as the "drill driver." By this separation, costs to the user have been cut 20% to 30% under conventional taper-shank drills. In the conventional drill, the shank must be discarded when the point and flutes are worn out. Here, however, the drill driver is used throughout the lives of many drills. Shankless drills are roll-forged and twisted, unlike the machined manufacture of ordinary drills, for improved structure.

Principal advantages are (1) Lower first cost. (2) Greater hole production because of greater strength. (3) Reduced breakage with tough "shock-absorber" neck. (4) Greater length of usable flute. (5) Greater scrap recovery value of unused portion of drill.

Wartime advantages of Wrigley's Spearmint Gum show how this quality product, too, can help industry—once it again becomes available. In the meantime, no Wrigley's Spearmint Gum is being made; and none will be made, until conditions permit its manufacture in quality and quantity for everyone. That is why we ask you to "remember the Wrigley's Spearmint wrapper," as the symbol of top quality and flavor—*that will be back!*

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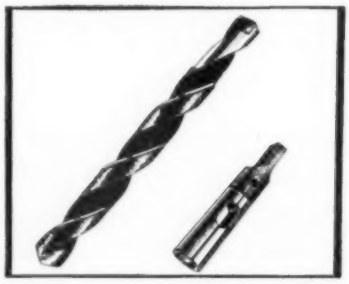

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(*Concluded from page* 222)

bob, using a neck 1½ in. square and 1 in. long. The defect is a pull down of the metal on the cope side of the casting, approximately 14 in. away from the neck of the riser. The casting on the left of Fig. 11 is made with a shrink-bob riser 6 in. in diameter and a neck 1½ in. square and 1 in. long. This casting was machined and found to be perfectly sound and dense.

The importance of the drag bob or drag portion of the shrink-bob riser can not be overemphasized. This was illustrated in a recent change made on cylinder castings for air compressors produced by Worthington Pump & Machinery Corp. These castings were gated with a shrink-bob riser illustrated in Fig. 12. The castings were cored out with a valve seat on the inside diameter adjacent to the flange. The valve seat must be sound and dense and free from surface flaws after machining. The system, shown in Fig. 12, provides for four castings on a plate with two shrink-bob risers fed by one sprue. Subsequent to the time of producing these castings, the job was subcontracted and the subcontractor provided his own pattern, illustrated in Fig. 13. This pattern permitted the molding of six castings per plate, poured vertically instead of horizontally, using a gating system with adequate risers but without any drag section or drag bob being incorporated. Furthermore, the neck was too long and too small to permit adequate feeding at the heavy boss section. As a result, all of the castings made from the pattern in Fig. 13 required a bushing, machined and located in the seat, in order to save the casting. The castings were externally sound, but the seat proved to be excessively porous. Even though these castings were poured vertically instead of horizontally, they could still have been made dense if a drag bob had been incorporated and the neck between the bob and the casting had been larger and shorter.

Although the authors know of no universal system of gating all castings, the shrink-bob riser, designed for and by the Gray Iron Research Institute, has been used successfully for a wide variety of grades of iron, and has overcome many shrinkage problems in heavy jobbing, light jobbing, and production foundries. It has provided substantial savings through decreased shrinkage defects and decreased cost of cleaning and machining.

Bibliography

1. "Risers or Gates for Some Special Nonferrous and Alloyed and High-Test Iron Castings," by C. Brisbois and A. E. Cartwright, A. F. A. *Transactions*, 1938.

2. "Production of Uniform Dense Structures in High-Test and Alloyed Iron Castings," by M. A. Scott, A. F. A. *Transactions*, 1940.

3. A. F. A. Shop Course 1941, E. J. Carmody.

4. Private correspondence with members of the Gray Iron Research Institute.

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REPAIR OF MALLEABLE IRON CASTINGS

(*Continued from page* 111)

whether or not preheating is necessary. Usually it is advisable to preheat for the welding of major defects.

2. *Welding*

a. White Iron—Welding should start immediately after preheating. Great pains must be taken to keep the heat in the casting high enough to prevent damage to the casting. Following welding, the castings should be immediately put in the heat treating furnace, or allowed to cool slowly and uniformly to room temperature.

b. Annealed Iron—In the welding of annealed iron even though it may be necessary to preheat the casting, working temperatures of the weld and parent metal adjacent to the weld, should be kept at a minimum consistent with good, sound welds.

With arc welding it is essential that instructions for the use of various types of rods, with respect to amperage, polarity, size, etc., be carefully followed.

Deep puddling is to be avoided. If it is necessary to make a deep weld, it

(*Continued on page* 226)

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(*Continued from page 224*)

should be done by building up with successive layers of beads, thorough peening following the laying of each bead.

Following welding, the castings should be immediately put in the heat treating furnace or allowed to cool slowly and uniformly to room temperature.

3. *Rod or Electrode*

a. White Iron—In the welding of castings in the white iron state—white iron rod should be used.

b. Annealed Iron—For the welding of soft iron or annealed iron castings, rods or electrodes should preferably be of such a nature that the weld has physical and mechanical properties, after final heat treatment, comparable to that of the parent metal. Weld deposit in all cases should be uniformly sound metal and readily machinable after post treatment.

4. *Flux*

In the case of gas welding, a suitable flux must be used. The flux should provide adequate flotation and fluidity so that the welds are sound and free of slag or gas inclusions.

5. *Post Heat*

a. White iron—Malleablize.

b. Soft Iron

(1) Gas welding—All castings that have been repaired by gas welding shall be re-malleablized.

(2) Arc welding—All castings that have been welded for major defects shall be subjected to a re-malleablizing treatment. Castings that have been welded for minor defects may be given a post treatment consisting of heating the castings to 1275-1325 F., holding for 8 hours followed by cooling in still air.

B. *Special Repair Procedures of Annealed Iron Castings*

1. *Welding with Monel Metal Rod or Nickel Rod*

This method is suitable for the repair of minor defects and particularly suitable for the repair of defects on machined surfaces and in cases where the castings cannot be given a re-malleablizing treatment.

a. Preheat—Generally no preheat is required; however, if it is deemed advisable to do so, recommendations are the same as in Paragraph "III A 1-a".

b. Electrode—A rod which will produce a weld deposit of approximately 70 per cent nickel, 30 per cent copper, or a rod that will produce a weld deposit of 94 per cent nickel and 6 per cent manganese should be used. The rod should not exceed 5/32-in. diameter, and may consist of a coated rod of desired composition or a sheathed and coated rod consisting of a nickel core, and copper sheath.

c. Welding—In general, procedure for annealed iron welding as outlined in paragraph "III A 2-b", applies equally to paragraph "III B 1-c". The purpose of this type of welding is to eliminate the necessity of a re-malleablizing treatment; therefore, it is emphasized that every effort should be made to keep the working temperature of the weld and the parent metal adjacent to the weld at an absolute minimum, which is conducive to good, sound welds. Welding is performed with a standard arc welding machine (ac or dc).

d. Post Heat—Castings shall be given a post treatment consisting of heating to from 1275-1325 F., holding for 8 hours, followed by cooling in still air.

2. *Nickel Welding (so-called "Cold Welding")*

This method of repair is particularly suitable for the repair of minor defects in machined areas, and also in cases where the castings cannot be given a post treatment.

a. Preheat—None required.

b. Welding—The welding transformer should provide low voltage (16-12 volts) with high heat (approximately 350 amp) so that the nickel is melted and is scratched off the wire while in a plastic form. No continuous arc is held as this would result in a hard, heat affected zone.

This welding operation should be performed by an operator of considerable experience, or one who has demonstrated his ability on samples which are cut and examined for hardness and bond.

c. Post Heat—None required.

3. *Brazing*

a. High Temperature Brazing (Over 1300 F.)—This method of repair is suit-

(*Continued on page 228*)

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Solubility in water:

Temp. °C	%NH_4BF_4 by weight
16	20.0
40	26.5
55	33.2
70	38.7
100	46.5

pH of 1% aqueous solution: 3.4 at 25° C (77° F)

Potassium Fluoborate KBF_4

Melting Point: 529.5° C (985° F) compound essentially stable. At pouring temperatures, slow decomposition.

Solubility in water:

Temp. °C	%KBF_4 by weight
25.	.55
34.7	.94
54.5	1.98
78.0	4.58
100.0	8.5

pH of saturated aqueous solution: 3.0 at 25° C (77° F)

Sodium Fluoborate $NaBF_4$

Melting Point: 384° C (723.2° F) slight decomposition. At pouring temperature, slow decomposition.

Solubility in water:

Temp. °C	% $NaBF_4$ by weight
26.5	52.1
40.0	55.3
78.0	64.4
100.0	68.6

pH of 1% aqueous solution: 3.0

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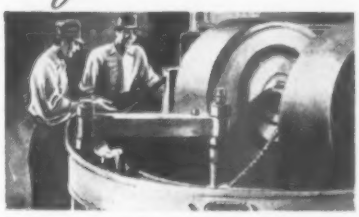

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Do not lose inhibiting action during baking; no excessive gassing. Give greater core strength.

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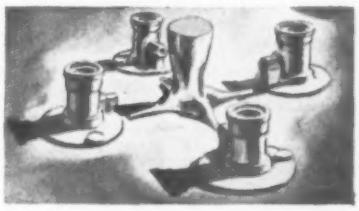

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(*Continued from page 226*)

able for both major and minor defects, and is particularly suitable for repair of castings that cannot be given a re-malleablizing treatment.

(1) Preheat—Same as Paragraph "III A 1-a".

(2) Brazing — Following preheating, the rod is held above the cavity and melted with the torch, the molten metal flowing into the cavity.

A suitable flux must be used to flux out the impurities and keep the slag fluid. Care should be taken that the melt is sufficiently hot to permit the impurities to rise from it. However, the temperature should not be maintained any higher than is necessary to accomplish a clean, sound braze.

During brazing a neutral flame should be moved about to maintain uniform temperatures, and to prevent the casting temperature next to the braze from dropping.

When completed, the casting should be immediately placed in the heat treat furnace, or allowed to cool slowly and uniformly to room temperature.

(3) Rod—Tobin bronze, manganese bronze or equal.

(4) Post Heat—Castings shall be given a post heat treatment consisting of heating to 1275-1325 F, holding for 8 hours, followed by cooling in still air.

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b. Low Temperature Brazing (Under 1300 F)—This method of repair should be confined to minor defects, and is particularly suitable for the repair of castings which cannot be post heated. Since this material melts at a temperature below the critical, and since it is unnecessary to bring the parent metal above this temperature, there is no change in the structure and, therefore, post-heating is not necessary.

Hard silver brazing rod, and other similar materials should only be considered for individual cases requiring special treatment. In these cases the procedure should be worked out and approved for the particular casting involved. This class of repair covers a great many widely divergent patented materials with entirely different procedures of application.

Suppliers of these materials should be consulted for proper procedures in case of their use.

These materials flow more freely and fill cavities with greater ease than the metal deposited in arc welding. Moreover, the deposited metal has strength equal to, or greater than, the parent metal, and is readily machinable.

Time is slightly longer than with electric arc, but with experienced operators and properly prepared castings, time can be materially reduced.

(1) Preheat—Same as paragraph "III A 1-a".

(2) Brazing—In general, the technique for low temperature brazing is the same as high temperature brazing, except that the operation is carried out at a much lower temperature.

(3) Post Heat—None required.

4. *Soldering*

This method of repair should be confined to minor defects. Using the proper type of solder (such as 97.6 per cent Zn, balance Cu, melting point approximately 700 F., or equivalent) and flux, soldering is permissible for the repair of gasket faces or other small machined surfaces showing defects where structural strength or high temperature is not involved.

Strong, uncut hydrochloric acid should be used for soldering flux and a soldering copper at dull red heat is the preferable method of applying the solder. Preheating the section with a blow torch to approximately 600 F, using 600 F Tempilstik as an indicator, has been found to improve the speed and quality of the job. This solder is harder than ordinary tin-lead solder and melts at a much higher temperature. Such repairs may be finished by filing, machining, or grinding.

5. *Mechanical Repairs*

Plugs are permissible to repair leaky areas which are subject to compressive stresses or low tensile stresses. Malleable iron plugs should be used and should be taper-threaded (SAE Dryseal American Standard Pipe Threads, pages 605-622, SAE 1944 Handbook) and so used as to have at least three threads engagement as finished. They should be inserted after coating both male and female members with a litharge, glycerine sealer.

(*Concluded on page 230*)

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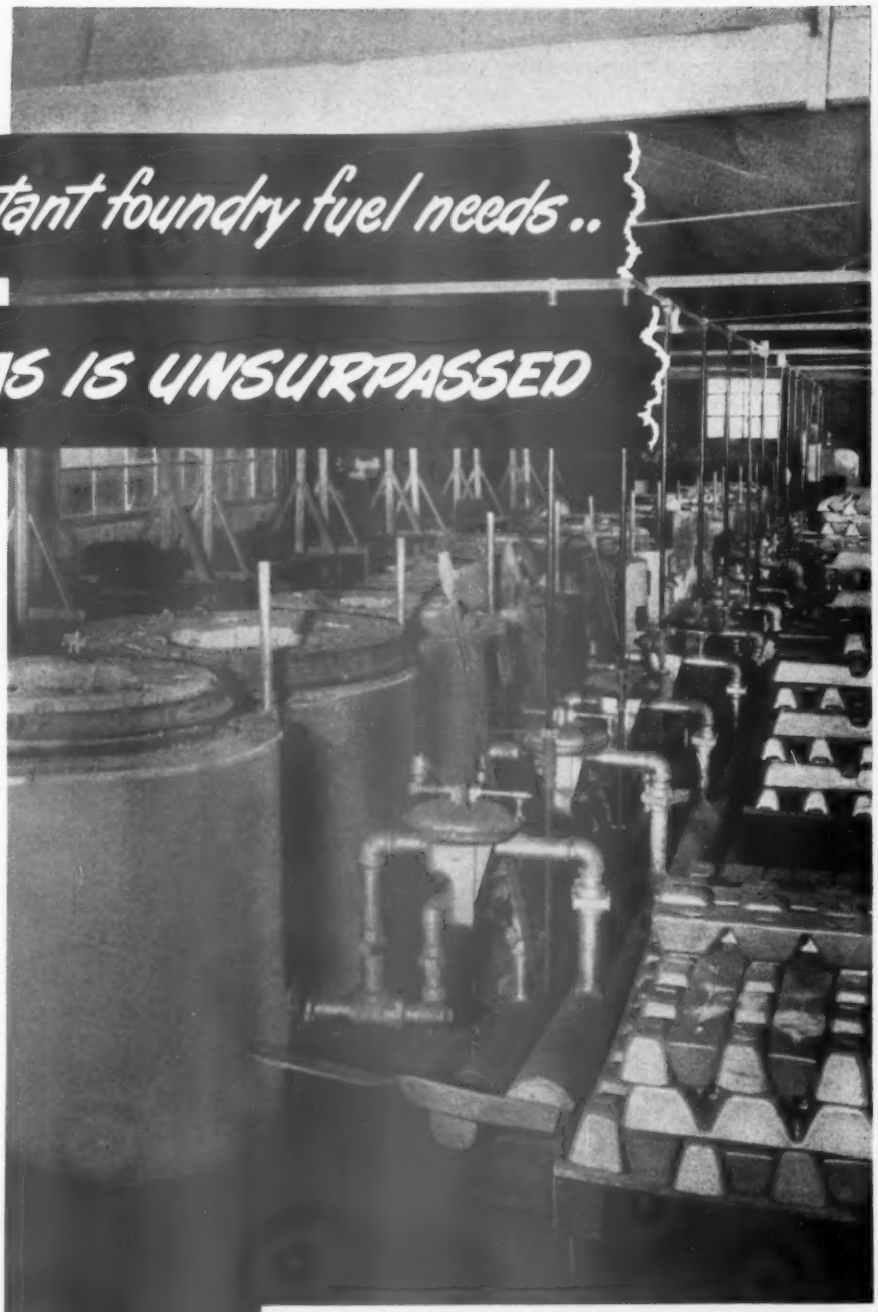

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(*Concluded from page 228*)

6. *Peening Repairs*

The use of round-nosed, either hemispherical or semi-cylindrical, peening tools and power hammers should be confined to weepers or seepers and should not be attempted for leakers, as defined in paragraph "III B-8". Where leaks exist beyond the weeper or seeper stage, peening repairs should not be attempted.

7. *Sealing Repairs*

For the repair of leakers beyond the category of weepers or seepers, where the test water under pressure comes through in a fine misty spray and not in a solid stream, polymerizing resin sealers may be used. To make a satisfactory repair, the cavity should be filled with liquid sealer and a pressure of at least 50 psi applied to force the sealer into the leaks. The sealer should then be drained, and the casting baked at the proper temperature for sufficient time to thoroughly polymerize the sealer.

Only those sealers may be used which, after polymerization, resist the action of water, alcohol anti-freeze, glycerine anti-freeze, ethylene-glycol anti-freeze, cooling system corrosion inhibitor, gasoline, lubricating oil, trichlorethylene, Stoddard solvent, kerosene, or other anti-freeze, corrosion inhibitors, or cooling system cleaners approved by the Procuring Services.

8. *Rusting Repairs*

The use of sal-ammoniac for rusting up seepers or weepers should be made only by dissolving approximately 10 per cent sal-ammoniac in the pressure leak test water and forcing the sal-ammoniac-water solution into the porous areas under pressure of from 65 to 100 psi. Sal-ammoniac should never be used by being placed on or in castings in high concentration without pressure. Use of sal-ammoniac should not be permitted for leakers beyond the category of seepers or weepers (where liquid comes through under test pressure at rate of not over two drops per second.)

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OBITUARY

HENRY P. MUELLER, 64, general manager of the Century Foundry, a division of Century Electric Co., St. Louis, died June 24, in that city. Mr. Mueller entered the foundry industry at the age of 14. Some years later he found-

HENRY P. MUELLER

ed the Mueller Brass Foundry Co., St. Louis, and in 1940 joined the Century organization. An active member of the St. Louis District Chapter of the AFA, he was committee member at the 1943 national convention held in that city. Mr. Mueller was also a member of the Gray Iron Founders' Society

• • •

Patrick W. Jordan, 74, widely known New England foundryman, died June 10 at his home in Fitchburg, Mass. For the past several years he had been connected with the Independent Lock Co., of that city. He was born in Kiddeminster, Worcestershire, England. With his parents and other members of the family he came to the United States in 1884 and shortly afterward started to learn the molder's trade. Later while working in a Boston foundry he graduated from a night high school course in 1892. Foundries in which he afterward served as foreman or superintendent include Victor Metals, East Boston; American Locomotive Co.; Snead Iron Works, Jersey City, N. J.; General Electric Co., Everett,

(*Concluded on page 232*)

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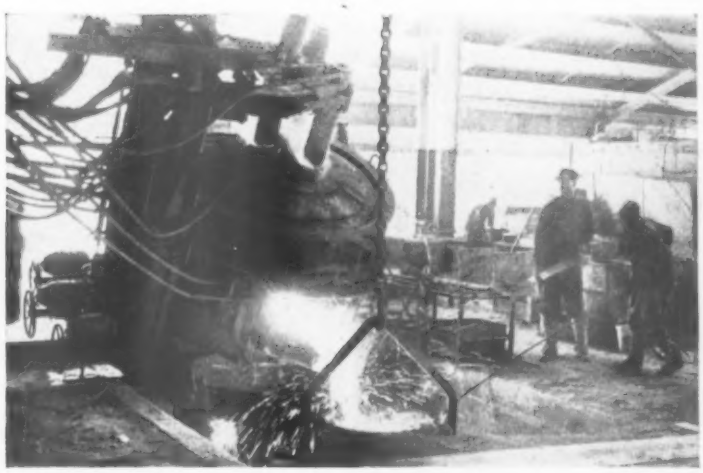
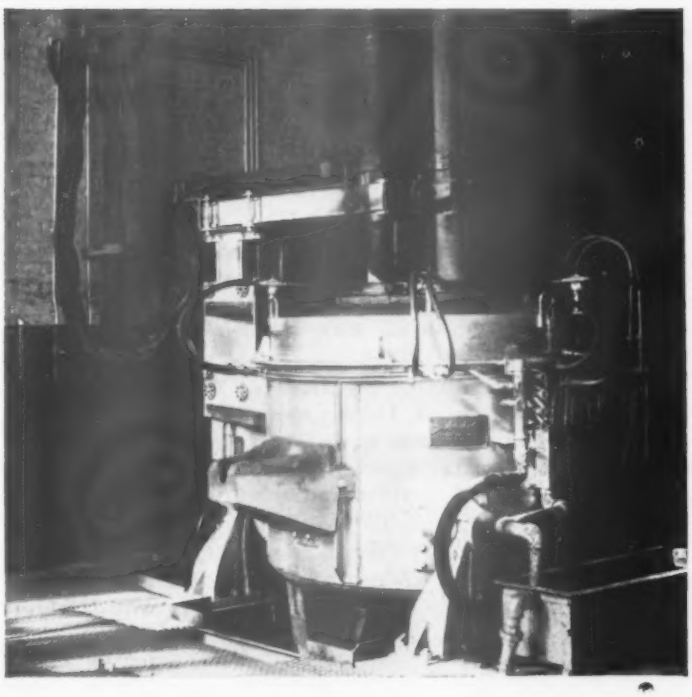


THE MONOLITHIC REFRACTORY LINING FOR ACID ELECTRIC FURNACES AND LADLES OF ALL SIZES

Now you can have Rammed Sidewalls in your acid electric furnaces, made from a mixture of "Ironton Caro-Line" and grain sized ganister. It is quickly and easily installed with regular furnace helpers. Spalling is practically eliminated, the rammed lining is highly resistant to slags and it lasts considerably longer than ordinary silica linings. This is not an experiment—it has been used by several progressive steel foundries during the past year. Ask us for additional information on this important development.



THE IRONTON FIRE BRICK COMPANY

RELIABLE REFRACTORIES

IRONTON OHIO

(*Concluded from page 230*)

Mass.; Whitcomb-Blaisdell & Co., Worcester, Mass.; and Mansfield Foundry Co., Mansfield, Mass. Big, bluff and hearty with a genial and forceful personality and a picturesque vocabulary, he contributed manfully to the hilarity of the baseball games and other feats of skill and daring featured by the New England Foundrymen's Association at the annual summer outings.

• • •

Bert Graves, 65, secretary of the West Steel Castings Co., Cleveland, and assistant to the president, died June 19 at his summer home in Perry, O. Prior to his affiliation with the steel castings company in 1941, Mr. Graves had been with White Motor Co., Cleveland, for 42 years.

• • •

Richard S. McCaffery, 71, professor of mining and metallurgy, University of Wisconsin, from 1914 to 1941, died June 12 at his home in New York. Since his retirement from the Wisconsin faculty, he had been a consulting metallurgist and mining engineer.

• • •

William MacArthur Sr., 78, retired foundry foreman for William C. Ellis & Sons, Memphis, Tenn., died June 15 in that city. A native of Glasgow, Scotland, he had lived in Memphis 60 years. After his retirement as foreman at the Ellis foundry, 13 years ago, Mr. MacArthur began operation of a small foundry and had received a number of government contracts for aluminum and brass castings.

• • •

John B. Strauch, 75, formerly president of the National Bearing Metals Corp., St. Louis, died June 22 in that city. A native of Marine, Ill., he joined the company in 1890 as a stenographer, subsequently becoming president and later chairman of the board.

• • •

Henry D. Miles, 80, for 45 years head of Buffalo Foundry & Machine Co., Buffalo, died July 5, in that city. Mr. Miles was elected president when the company

HENRY D. MILES

was founded in 1900, becoming chairman of the board in 1943. He was honorary chairman of the general committee of the Western New York Chapter, AFA, for the 1944 national convention in Buffalo.

• • •

Albert C. Force, 57, assistant to president, Chicago Railway Equipment Co., Chicago, and also associated with its subsidiary, Chicago Mfg. & Distributing Co., died June 14 in that city. He had been affiliated with these companies since 1936.

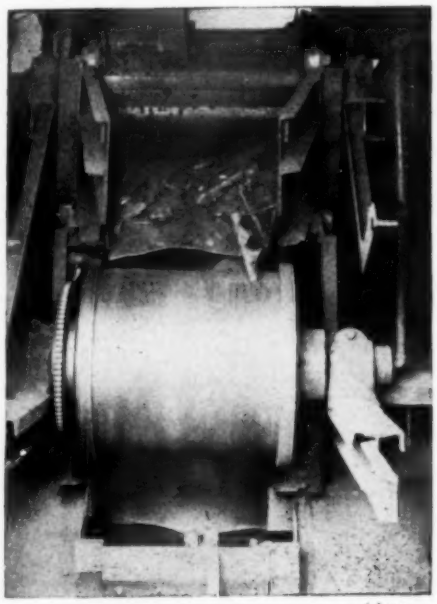
• • •

R. A. Manegold, 63, president, Dings Magnetic Separator Co., Milwaukee, died June 19 in that city.

Advises Procedure In Labor Cases

A guide for employers in handling cases brought up by the National Labor Relations Board is contained in a report, "How to Handle Your NLRB Case," published by the Labor Relations Institute, 1776 Broadway, New York 19, and available at $1.50. One of a series on collective bargaining techniques, the guide is an analysis of the policies and functions of NLRB, and includes recommended procedure for the employer.

A Difficult SAND RECLAIMING Job Licked by Stearns MAGNETIC



HOW to eliminate the scrap metal from hot sand coming off of a steel conveyor was a problem in the foundry division of a prominent automobile maker. And this sand was hot! Conveyor belts were out of the question.

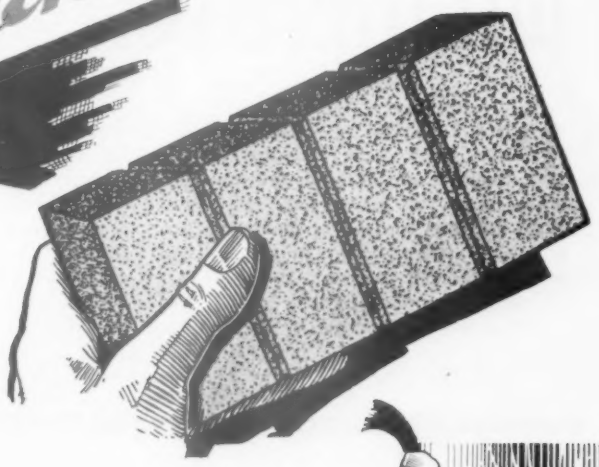
STEARNS Magnetic engineers were consulted and made a study of this problem. Out of their many years of experience in solving foundry problems they installed this specially designed and constructed magnetic drum. It's doing a swell job!

Avail yourself of STEARNS Magnetic advice on sand reconditioning problems or other jobs involving the removal of iron. We can give you a positive, automatic, time and labor saving method with STEARNS Magnetic equipment.

We will be glad to mail this folder or other Bulletins on Magnetic Separators. Write for them.

STEARNS MAGNETIC MANUFACTURING CO.
662 S. 28th St., Milwaukee, Wis.

Dependable Casting Improvement!



FOR IRON FOUNDRIES--

Famous CORNELL CUPOLA FLUX

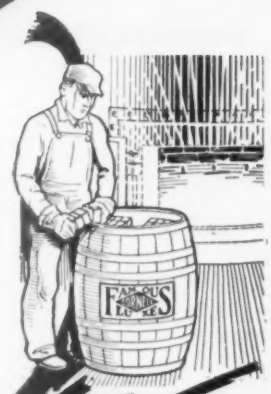
This amazing iron cupola flux shortens heats, makes metal cleaner and more fluid.

Castings come cleaner, sounder, denser grained and are more easily machined.

The flux-glazed brick in the melting zone lasts longer and you get cleaner drops.

Cleaner ladles, too, are evidence of the purging and purifying action in the cupola.

Famous Cornell Cupola Flux in its exclusive SCORED BRICK FORM takes but a few seconds to use, promotes accurate measurement. Toss in one brick to each ton or break off a briquette (quarter section) for each 500 lbs. of iron. It does not blow out with the blast but stays in melting zone until completely consumed.



FAMOUS CORNELL FLUXES

Trade Mark Registered

FOR BRASS AND ALUMINUM FOUNDRIES

Famous CORNELL BRASS FLUX

Makes metal pure and clean even when dirtiest brass turnings or sweepings are used. Iron particles between 3% and 4% are eliminated. Castings are tougher and denser grained, withstand high pressure tests—and take a beautiful polish.

The amount of Famous Cornell Brass Flux depends entirely on the type and nature of the castings and the character of the scrap that is used. Special instructions on the proper use of this flux to bring the best results will be sent at your request.

Famous CORNELL ALUMINUM FLUX

The use of this outstanding aluminum flux is a definite means of obtaining clean, tough, denser grained castings, free from spongy and porous spots. And the castings take a higher polish.

Thinner yet stronger sections can be poured—and more scrap can be used.

NO FUMES! Our exclusive formula prevents obnoxious gases, contains no ground glass or silica.

Metal does not cling to dross.

Write for Bulletins

The CLEVELAND FLUX Company

1026-1036 MAIN AVENUE, N. W., CLEVELAND 13, OHIO

Manufacturers of Iron, Brass and Aluminum Fluxes, Since 1918

WASHINGTON *Notes* ★★★

PRODUCTION of civilian goods is slow to increase and still is relatively scant, although this was generally expected to be the case when WPB revoked various of its production limitation orders. In a number of instances certain material shortages are impeding manufacturing; in other cases facilities and manpower are short. For example, production of electric irons must contend with a relative scarcity of nickel, stainless steel, phenolic plastics and resistance wire. Output of aluminum utensils is not expected to increase appreciably before fourth quarter, principally because of inadequate facilities of the aluminum industry for producing sheet circles, although some foundry capacity is available for making cast ware.

★ ★ ★

More construction work now is permitted, but the supply of certain construction materials and components remains tight and many projects must be deferred. Lumber is still critically short; cast iron pipe is in extremely tight supply, and while the steel situation is improving, the fabrication and distribution of end products will take time.

★ ★ ★

CEILING prices of cast iron soil pipe and fittings have been increased $5 a ton, the first change since February, 1942. The increase, amounting to about 7¼ per cent, was granted by OPA to meet higher costs of raw materials and the wage advance of 5 cents per hour recently granted workers. Both cast iron soil pipe and malleable iron pipe fittings and unions are included in WPB's latest list of critical materials and products.

★ ★ ★

OPA has merged its iron and steel price branch with that covering nonferrous metals, the new branch being known as the Metals Price Branch. Warren M. Huff is price executive of the new branch, with Wylie McKinnon associate executive. The section applying to ferrous castings is headed by Weldon Welfling and Joseph B. Meier is chief of the Nonferrous Castings Section.

★ ★ ★

A NEW priorities system is to be introduced gradually during the latter half of this year, so that by next Jan. 1 priorities assistance will be discontinued for virtually everything except military requirements. Under the new system the present AA rating method and the Controlled Materials Plan will be discontinued at the end of 1945 and replaced by a system in which the AAA rating will still be assigned in emergencies as under existing procedures but a new MM rating will be assigned by military agencies.

★ ★ ★

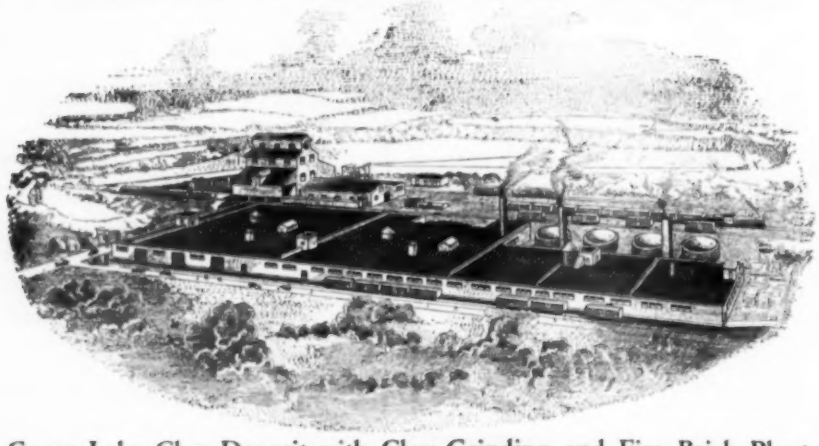
During the transition period from July 1 to Dec. 31, the MM rating will be equivalent to AA-1. Beginning Oct. 1, no more AA ratings will be assigned except for deliveries to be made before Jan. 1, 1946. Prior to Oct. 1, outstanding AA ratings calling for delivery after the end of 1945 will be canceled. WPB will, if necessary, provide additional procedures to give assistance for war-supporting or highly essential civilian purposes.

★ ★ ★

Although declining production of munitions is reducing employment, manpower still is a serious problem for many foundries. At a recent meeting of the Gray Iron Casting Industry Advisory Committee the members pointed out that their difficulties could be summed up in the one word, "manpower," particularly in the skilled trades. Selective Service was warned by the Gray Iron Founders' Society that production would "drop sharply and seriously" if the new regulation tightening up on deferments of workers under 30 years of age is permitted to deplete the industry's key force as much as expected.

GOOSE LAKE

Fire Clay and
Fire Clay Flour
Fire Clay Brick
Therm-O-Flake Insulation



Goose Lake Clay Deposit with Clay Grinding and Fire Brick Plant

Illinois Clay Products Company

JOLIET, ILL.

SHRINKAGE . . . SEGREGATION . . . MICRO-SHRINKAGE . . .
GAS POROSITY . . BLOWHOLES . .

Eliminate These Typical Production problems with

The X-RAY PLAN

FOR

QUALITY CONTROL OF FOUNDRY PRODUCTION

A New Service for Foundries

The X-Ray Plan for Quality Control undertakes to improve and check foundry practice by providing, as it does, a quick, complete "look inside" the walls of a casting, giving a record of the flow of metal, the changes brought about in cooling and an over-all picture of the finished casting. We offer you, in addition, such chemical and physical analyses as are desired, including sand control and analysis. « « « We invite you, Mr. Foundryman, to add the resources of X-Ray inspection and control to your production facilities —our business is strictly a *service* through which you can extend your organization to include a complete X-Ray and metallurgical diagnosis department of skilled personnel—all at a fraction of the cost of establishing your own X-Ray department.

Your request for further details will be welcomed—or a member of our staff will call in person if you wish.

X-RAY INCORPORATED

Specialists in Industrial, Metallurgical Radiography

2740 BOOK TOWER RANDOLPH 2544 **DETROIT 26, MICH.**

Chicago Laboratories — 2532 Cottage Grove Avenue

NEW EQUIPMENT and SUPPLIES

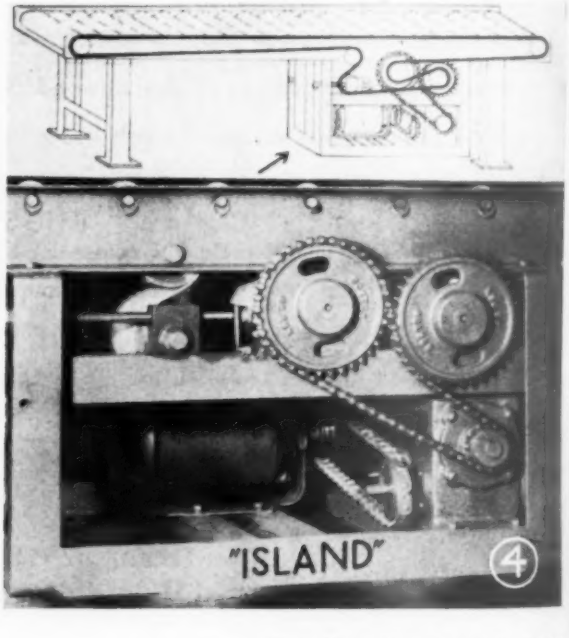
(1)—Hardness Tester: Steel City Testing Laboratory 8843 Livernois Ave., Detroit 4, Mich., announces a portable instrument for checking hardness of material when it is not necessary to obtain a scientifically accurate test on laboratory equipment. The device consists of a self-acting hammer which, by means of a strong spring, causes a steel ball on its end to strike against the material to be tested. Diameter of the impression thus made, checked with microscope and chart supplied, indicates how the material corresponds to the desired hardness.

(2)—Conveyor: American Conveyor Co., 2435 Indiana Ave., Chicago 16, Ill., has added a new unit, called the Flight-Veyor, to its line of portable electric conveyors. Used for raising bulk materials up steep pitches impractical for a belt, it is equipped with 1¾-in. chain-flights and is built in four sizes—8 and 12-in. widths and 13 and 20-ft lengths. It lifts up to 14 feet at the rate of 160 fpm. Drive is by means of roller sprocket chains through a countershaft, and sprocket shaft ball bearings are permanently sealed. Steel flight pan is heavy high carbon steel.

(3)—Stock Rack: Unistrut Products Co., 1098 West Washington Blvd., Chicago, Ill., is offering a framing and support system for quickly fabricating any type metal frame, stock rack, etc. The material consists of a slotted hollow-square steel or other metal section and standard spring-held nut attachments. It requires no drilling of holes, riveting or welding, and can be cut to desired length with a hack saw. Nut attachments can be slid to any desired points to attach to another member, to a supporting structure, or to the floor, ceiling or wall. Nuts are held firmly by their serrated teeth, which bite into the inturned edges of the hollow square section. Sections are available in various lengths and gages.

(4)—Conveyor Drive: Island Equipment Corp., 101 Park Ave., New York 17, N. Y., is introducing a power unit, known as Power-Pac, for motorizing conveying equipment. It consists of motor, driving rolls, switch speed reducers (where wanted), controls, proper gears and all necessary mechanism to enable the user to make the proper connections

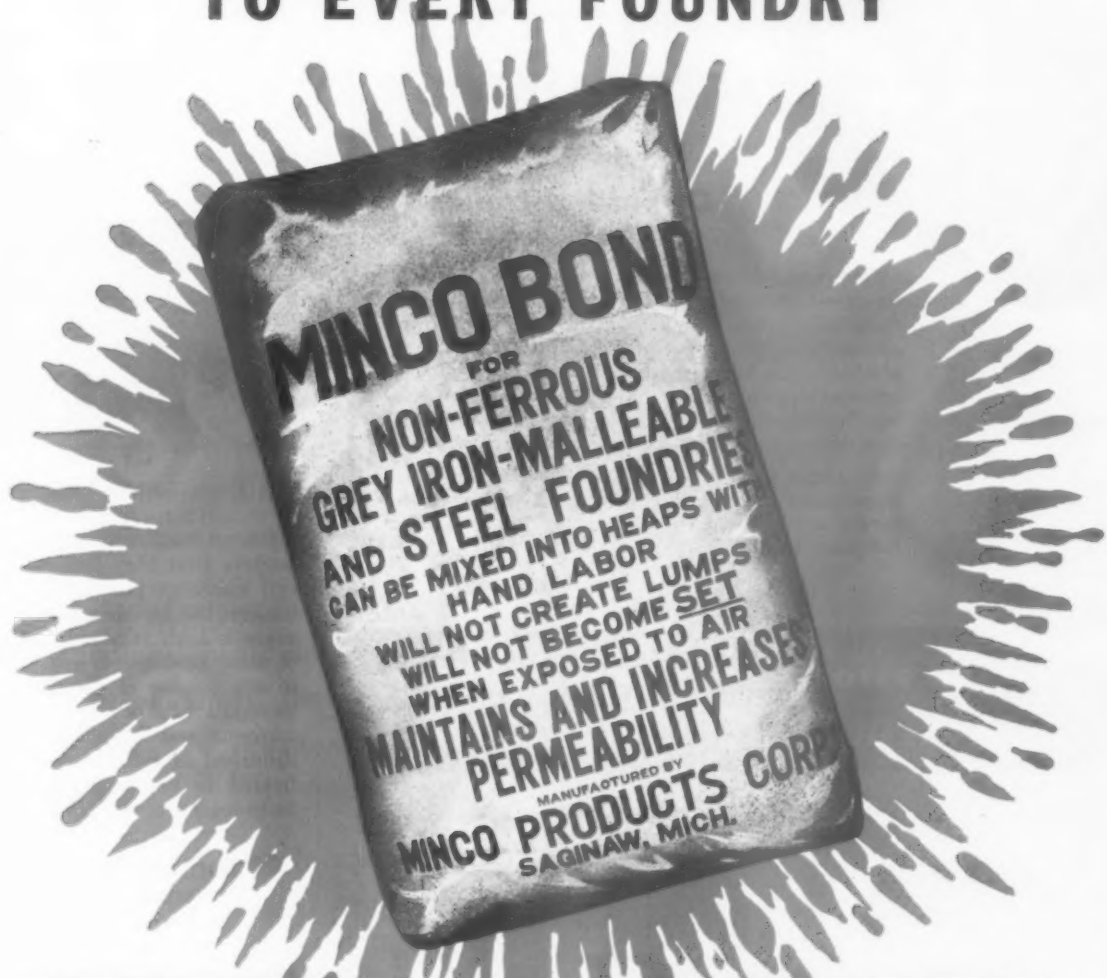
(*Continued on page* 238)



Now Available

TO EVERY FOUNDRY

MAINTAINS PERMEABILITY



INCREASES PERMEABILITY

MINCO BOND

STEEL FOUNDRIES OF AMERICA—ATTENTION

In our field work we have found the major steel foundries of the nation using Western Bentonite with various cereal binders as bonding agent together with coarse and fine silica sand, moisture 2.5% to 3.5% and 5 lbs. to 6 lbs. green strength. If higher green strength is used, it creates low flowability, which necessitates excessive jarring of molding machine to get uniform mold hardness, and low collapsibility, creating an excessive labor cost in getting sand out of the flasks; also, with the low green strength of 5 lbs. to 6 lbs. the mold surface spalls off if mold is touched but lightly, corners and edges crumble and mold cannot be patched.

Very favorable conditions are attained when MINCO BOND is substituted for all cereal binder. About 2% of MINCO BOND with 2% Western Bentonite creates about 8 lbs. green strength. High flowability will be attained, sand will flow freely from chutes and minimum jarring will get uniform mold hardness. High collapsibility will be attained and castings will shake out of sand freely and the sand will be free of lumps. With 8 lbs. green strength the mold surface will be firm and no sand will spall off the mold surface, corners and edges will remain firm and stable and if necessary, the mold can be patched.

Below is given a tentative facing formula for molding sand, which will be found very beneficial in the casting of steel:

2% MINCO BOND, 2% Western Bentonite, 96% Silica Sand, 2.5% to 3.5% Moisture, 150 to 250 Permeability.

The 4% of bonding minerals as given above should create 8 lbs. green strength. If for any reason 8 lbs. green strength is not attained, increase the mineral content enough to bring about the required 8 lbs. green strength.

A good formula for making cores for steel practice without oil consists of new silica sand 15 parts, MINCO BOND one part, one-half part cereal binder. Mix on the wet side, i.e., 6% to 7.5% moisture. Ram hard. Spray green core with any suitable water based core wash and bake in one-half the time needed to bake a like core oil core.

In this core formula all burned sand can be used or new sand and burned sand 50-50 can be used. Cereal binder can be increased or decreased to the desire of the user. Resin or pitch can be substituted for cereal binder, if desired.

NOW IS THE TIME, WHILE RECONVERTING, TO GIVE MINCO BOND A TRIAL.

MINCO PRODUCTS CORPORATION

SAGINAW, MICHIGAN

WARNER R. THOMPSON CO.
7328 Hamilton Ave., Detroit, Mich.

THE BUCKEYE PRODUCTS CO.
7020-34 Vine St., Cincinnati, Ohio

MARTHENS COMPANY
1205 4th Ave., Moline, Ill.

FOUNDRY SUPPLIES CO.
461 W. 33rd St., Chicago, Ill.

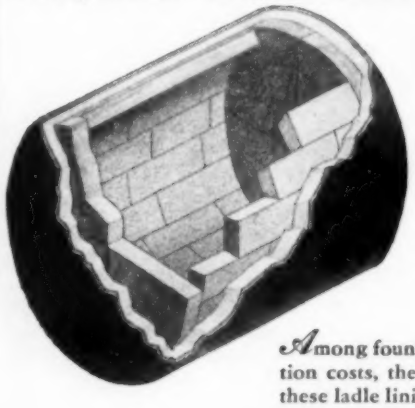
HOFFMAN FOUNDRY SUPPLY CO.
1193 Main, Cleveland, Ohio

WM. R. BARNES COMPANY, Ltd.
243 Cumberland Ave., Hamilton, Ont.

WOLVERINE FOUNDRY SUPPLY CO.
3211 Bellevue, Detroit, Mich.

SHANAHAN'S LIMITED, Vancouver, British Columbia • SHANAHAN'S LIMITED, Winnipeg, Manitoba

They Wear Longer and Reduce Maintenance Costs!



CHICAGO RETORT

FITTED LADLE LININGS

For Crane and Cylindrical Ladles

Among foundrymen, interested in lowering production costs, there is a steadily increasing demand for these ladle linings. They have proven, under their own operating conditions, that the *"Cross-Grained"* structure of these linings has greater resistance to the destructive action of erosion, and that the fitted, accurately ground, bevelled side liners and sectional ends effectively speed up installations—all important savings in time and labor.

Still another result of our research—working in close cooperation with leading ladle manufacturers—is a tongue and grooved fitted lining for desulphurizing ladles and forehearths.

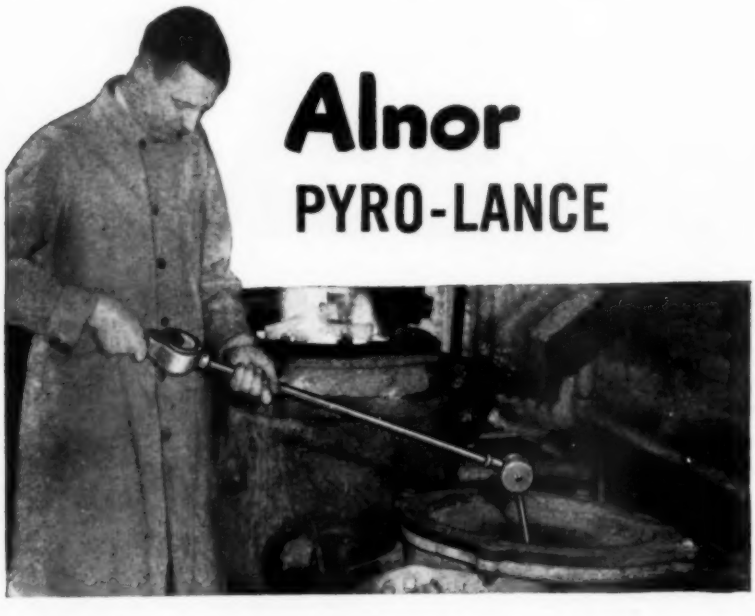
Lower Melting Cost and Get 50% Longer Life with **Chicago Retort's CUPOLA BLOCK and BRICK** *made by a patented "Cross-Grained" Process*

ANTI FLUX

CHICAGO RETORT & FIRE BRICK COMPANY

Manufacturers Since 1879

208 SOUTH LA SALLE STREET • CHICAGO 4, ILLINOIS



Alnor PYRO-LANCE

built to stand up in foundry service

This portable pyrometer is built with a rugged shock-resisting movement and an enclosed extension thermocouple—a unit especially designed for reliable foundry service. It gives you the quick, accurate temperature readings so important to efficient, economical production of sound castings.

The Alnor Pyro-Lance is especially suited to use with molten brass, bronze, copper, aluminum bronze, magnesium alloys, and similar metals where temperatures are not over 2300 degrees F. The special enclosed thermocouple takes true readings below the surface, unaffected by dross or surface conditions. Standard range is 0-2500 F.

Write for bulletins.

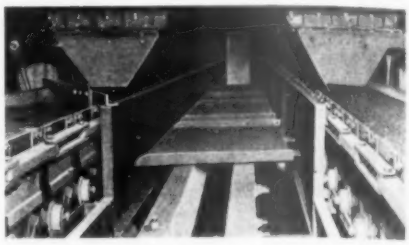
ILLINOIS TESTING LABORATORIES, INC.

420 NORTH LA SALLE STREET • CHICAGO 10, ILLINOIS

(*Continued from page 236*)

to their equipment. In this manner, an ordinary gravity conveyor can be motorized. The entire unit measures 15 x 24 x 17 in. and weighs 167 lb crated.

Conveyor: Link-Belt Co., 307 North Michigan Ave., Chicago 9, Ill., has developed a new type of conveyor designed to handle bulk materials in a horizontal run-around path within minimum headroom. Material is carried in buckets supported on rollers. The unit provides conveyor storage for materials



that are to be discharged simultaneously in varying quantities at a number of points. Surplus material left in the buckets after they have served the several discharge points will remain in the buckets, to be recirculated. The conveyor is both self-feeding from any one of many feed spouts and self-discharging to any number of points. Two or more materials can be separately fed to the conveyor and the admixture will not be disturbed in transit; also it will be delivered in the same mixed proportions as prevailed at the feed points.

Foundry Flasks: Algoma Products, 3080 East Outer Dr., Detroit 12, Mich., is introducing heavy duty foundry flasks, built for hard service and long life. Fabricated from hot-rolled steel,

the flasks are heat treated after welding to normalize construction and to insure equal stress. They are designed to be installed with straight or cut-to-pattern flask bars, according to specifications.

Dual Fuel Engine: Worthington Pump & Machinery Corp., Harrison, N. J., announces an engine capable of instantaneous conversion from oil to gas fuel without change in load or speed. Conversion from one fuel to the other or adjustment of a combination of both is accomplished by one revolution of a

(*Continued on page 241*)

HOW CAN 8 3/4 HOURS CONSTITUTE AN 8 HOUR SHIFT?

That's easy. Just switch to faster cutting ELECTRO Grinding Wheels. Get at least 10% greater cutting effectiveness.

Reduce the fatigue factors. Fast-cutting ELECTRO Grinding Wheels do not try the patience of operators. Their great strength and rugged construction, command confidence.

ELECTRO Grinding Wheels work smoothly and easily without "nursing." They vibrate less and cut cooler.

This faster cutting and these fatigue reducing factors, lift morale, renew enthusiasm. A 10% gain in the *effectiveness* of cutting time, is a *reasonable* expectation.

Why not phone us now?—and let us send an ELECTRO Engineer to prove it? Our number is WAshington 5259, Buffalo, N. Y.

E-306

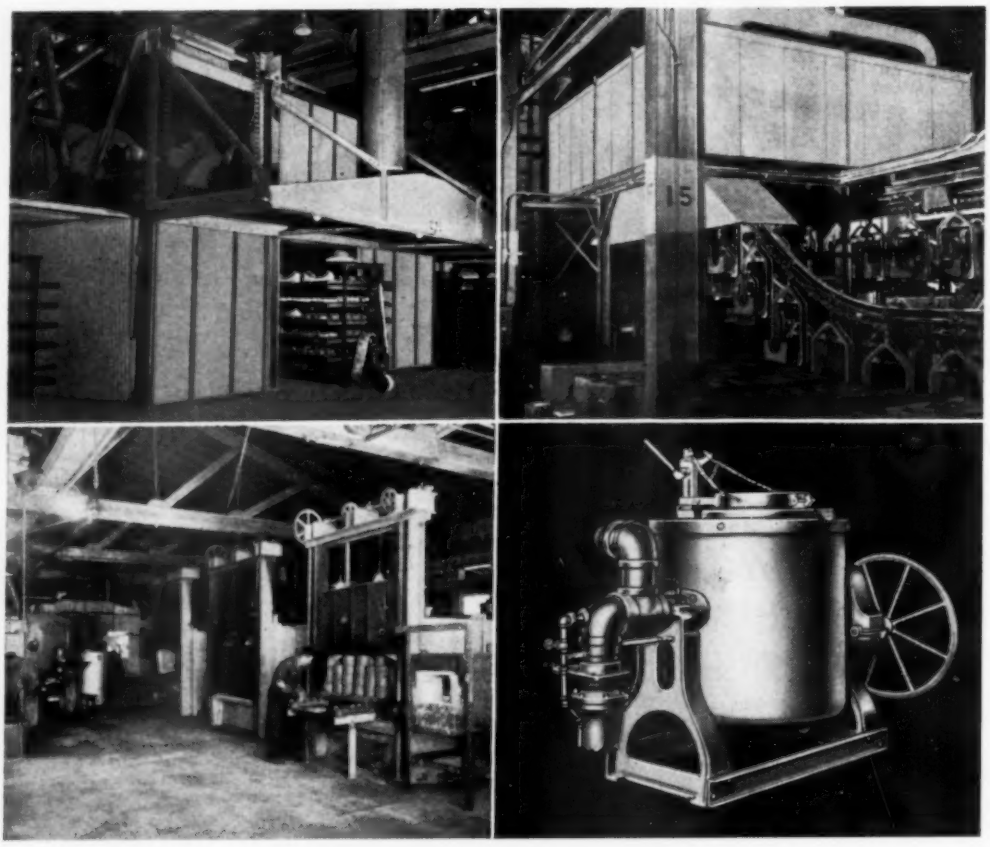
Electro TRADE MARK SINCE 1919

Electro REFRACTORIES & ALLOYS CORPORATION

MFRS. • CRUCIBLES • REFRACTORIES • STOPPERS • ALLOYS • GRINDING WHEELS

344 DELAWARE AVENUE — *Established 1919* — BUFFALO 2, NEW YORK

.... How UP-TO-DATE are Your Core Ovens and Furnaces?



Left—Gehnrich truck loading type, gas-fired, recirculating air heated core baking ovens.

●

Right—Large continuous monorail-rack conveyor oven for core spray drying.

●

Left—Rockwell batch type furnaces, oil- or gas-fired, for annealing castings.

●

Right — Rockwell standard tilting type, crucible melting furnace for non-ferrous metals.

In your program for reconversion, improvement or enlargement of production facilities, have you considered how much you can step up production efficiency by installing ovens and furnaces that help increase output of better product at lower cost?

By placing full dependence on the Rockwell-Gehnrich organization to engineer the complete heat processing job—whether in core baking, melting metal or annealing—you are assured of a single responsible source, backed by over 60 years of leadership in the field, for the kind of equipment you should have.

Gehnrich Ovens for core baking, low temperature heat treating, baking finishes on castings, are built in any type and size for batch or conveyor handling.

Rockwell builds stationary crucible or tilting non-ferrous melting furnaces; box type, car hearth, elevator, roller hearth or other continuous furnaces for annealing, stress relief, normalizing, drawing or other heat treating—in standard and special designs—to your requirements.

Let the Rockwell-Gehnrich interesting catalog show how to make your plant heat processing operations more profitable.

Write for Catalogs

W. S. ROCKWELL COMPANY • 56 CHURCH ST., NEW YORK 7, N. Y.

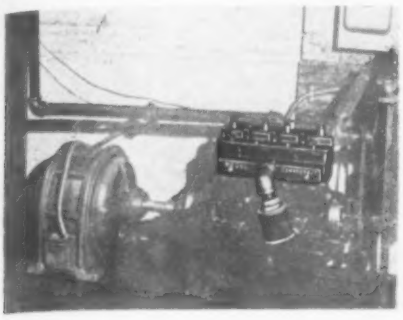
GEHNRICH OVENS • ROCKWELL FURNACES

BATCH OR CONVEYOR TYPES • OIL - GAS - ELECTRIC - STEAM - COKE

(*Continued from page 238*)

single control wheel. Regardless of the fuel being used, the engine operates on the efficient diesel cycle, thus realizing fuel economies heretofore unobtainable in gas engine operation.

Compressor Head: Metallizing Co. of America, 1330 Congress St., Chicago 7, has available a new compressor head, designed for use on a Model A or B Ford motor block. Designed to deliver a volume of 139 cubic



feet per minute with an actual delivery of 100 cubic feet per minute at 100 pounds pressure, the complete unit includes valve and water chambers, air intake manifold, air strainer, unloader, pilot valve, and necessary parts for assembly.

Die Filing Machine: Milwaukee Chaplet & Mfg. Co., 1025 South 40th St., Milwaukee 4, Wis., has redesigned its die filer used in filing, sawing and lapping operations as well as for fast precision trimming of small castings, stampings, forgings and other metal parts. In tool and die making the file support unit or saw overarm may be swung out of the way, enabling the op-

erator to remove the die block quickly for frequent checking and return it to the original setting. Saw overarm may be substituted for the roller file-support arm in a few minutes. Hold-down fingers are attached directly to the saw overarm. Lapping-sticks may be substituted for files or saws by means of a lapping-stick holder which is readily inserted into the chuck jaw. At its rated speed of 325 to 450 strokes per minute, its 1½-inch stroke covers from 487 to 675 cutting inches per minute. The ma-

TAMASTONE

One of many ways to save money in your foundry and speed up production!

HUNTER FOUNDRY CO., CHICAGO REPORTS

500% INCREASE

With original equipment, gated pattern and hard match only 10 to 12 molds per day were possible. Through the use of TAMASTONE Pattern Compound (100 lbs.) the job is converted to separate cope (A) and drag (B) patterns and production is now 60 molds per day. This new method enables the foundry to draw pattern from the sand as offset parting, eliminating the amount of sand to be lifted in the cope. Equipment is gated for pouring manganese.

Savings from 300 to 500% are possible in your plant! Write for literature!

TAMMS SILICA CO.

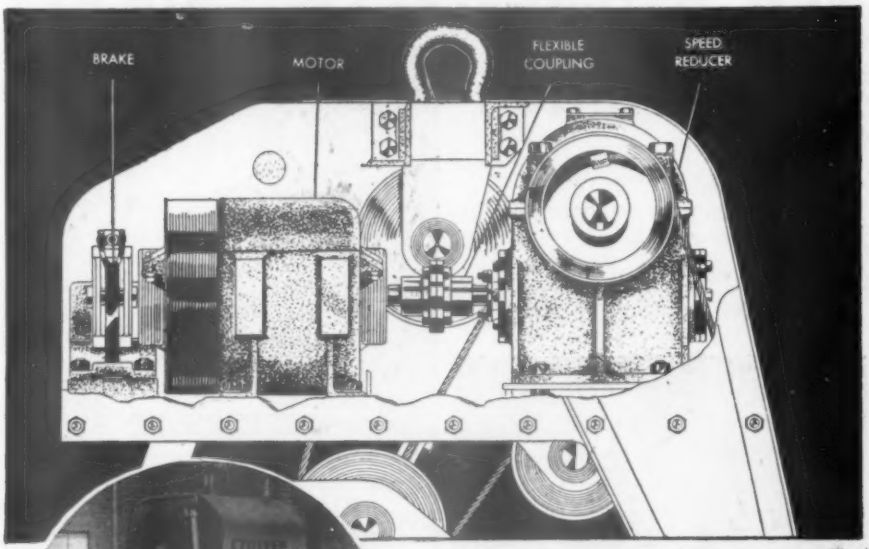
228 N. La Salle St. • Chicago 1, Illinois

(A)—COPE is entirely made of TAMASTONE.

(B)—DRAG is of TAMASTONE with a metal gate.

Note irregular shape of manganese casting.

14" x 24" SLIP FLASK is designed to conform with extremely irregular parting line and manganese casting. Cope 11" high with 6" offset and 4" drag.



HOOK 'ER ON—PLUG 'ER IN

ABOVE YOU SEE WHY the Erie Electric Bucket works in its own headroom controlled from the crane cab. This sturdily constructed bucket needs only to be hooked over the crane hook and power line plugged in. The man in the cab controls the opening of the bucket from cracking the lips to any degree of opening or closing. The extra in-built weight permits easy penetration. *Write for complete particulars.*

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ERIE BUCKETS THE MOST COMPLETE LINE BUILT

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FLEXIBLE SHAFT MACHINES
ONE HUNDRED TWENTY-FIVE TYPES AND SIZES, 1/8 TO 3 H. P.

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VERTICAL

THREE SPEEDS
OR
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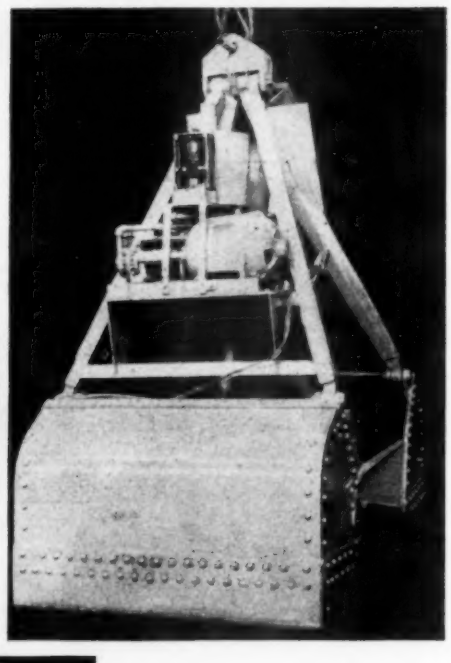
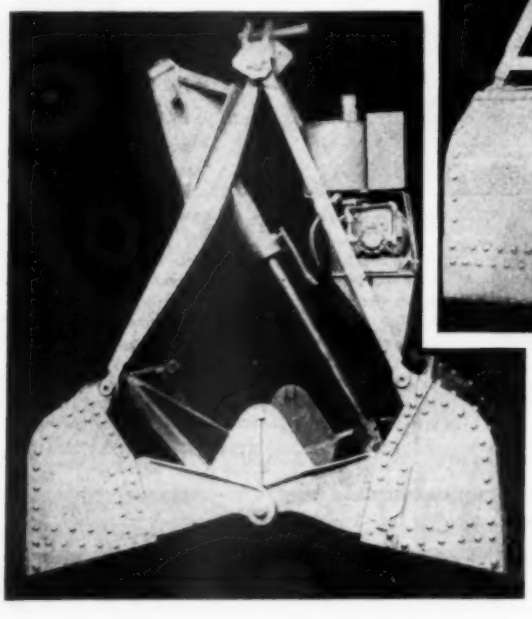
NEW HYDRO-ELECTRIC BUCKET
BY
BROWNING

This is a new hook-on fast operating electric bucket. Can be made to operate on either A.C. or D.C. The bucket operates on a new patented principle.



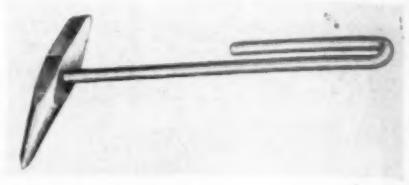


VICTOR R.
BROWNING
COMPANY, INC.
WILLOUGHBY, O.

★

chine is regularly equipped with standard electric motor, file roller support and saw overarm, but is available without the saw overarm or without motor if desired.

Chipping Hammers: Chicago Mfg. & Distributing Co., 1928 West 46th St., Chicago 9, Ill., announces an addition to its line of welders' chipping hammers, several available with steel handles of high-grade ⅜-inch round



steel. The type shown in the illustration has a combination drift and chisel for general chipping purposes, with special hand grip to absorb shock when chipping and to hook on welder's belt when not in use. The head of another type has two chisels at right angles. Both types can be supplied with removable wire brush, fastened to the handle by special clamps and counter sunk screw.

Expansive Bit: Bruno Tools, 9330 Santa Monica Blvd., Beverly Hills, Calif., has developed a new-type expansive bit for use in hand braces to cut holes in wood. The center lip which cuts away the core at the center of the hole extends back to form a clamp, locked tightly by means of a machine screw, which firmly holds the adjustable blade at

the diameter set. An improved diamond-shaped screw point lessens chance of breakage and helps to pull the bit entirely through the wood, requiring only light pressure to cut quickly and cleanly. Two models are available. The first, 7 inches long, cuts holes from ¾ to 1¾ inches. The second, 8½ inches long, cuts all diameters from 1½ to 3½ inches. Both tools are equipped with standard square bit stock shank.

Jig Set: Steel Tools Inc., 2307 Prospect Ave., Cleveland 16, O., has introduced a jig set consisting of 1000 precision parts in a cabinet, ready for assembly of jig requirements. A few of its many features include use as a checking, drilling or layout fixture, precision layout fixture, assembly jig fixture, and as a perforating fixture for metal and plastic materials.

TO THE RAILROAD INDUSTRY

FOR

Distinguished Service

With a total of 2 trillion, 256 billion, 334 million ton-miles of freight service . . . and 254 billion, 194 million miles of passenger service since the start of World War II, the railroads of America have achieved a record of performance that will live forever in the annals of industrial history!

Federated is proud to salute the railroad men of America for doing a marvelous job despite the handicaps of labor shortages, deteriorating equipment and delivery delays.

And proud, too, that nearly two billion pounds of Federated non-ferrous metals supplied to the railroads and other American industries are helping to pave the way to ultimate victory.

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★ HARD SETTING

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Shelton Metallic Filler is packed in cans of 1, 5, 10, 25 and 100 lbs. Write for sample.

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A. A. WICKLAND & CO.

ENGINEERING BUILDING • CHICAGO (6)

TELEPHONE DEARBORN 9344

STEEL FOUNDRY CAN BE KEPT CLEAN

(*Continued from page* 107)

sand employed is Ottawa silica of 40 to 50 grain fineness, and new sand is added only to the facing, none to the heapsand. Facing sand and heap sand are prepared in separate mullers side by side. Loading side of the mullers is equipped with vibrating screens to remove lumps and other debris. Both screens and mullers are hooded and attached to an exhaust system which effectively removes any dust. Heap or used molding sand is brought to the mullers from a large pile close by in a small gasoline motor driven truck equipped with a dump bucket.

Castings are shaken out by the night crew at a point almost opposite the sand conditioning equipment. After cooling the heavy castings are abrasive blasted in a room type unit equipped with an overhead tramrail. Castings are placed on hooks suspended from trolleys and on which they are transported through the blasting room. After being cleaned the heads and risers are burned off the castings in an adjoining space, and the castings are moved on for further operations of rough grinding, chipping, finish grinding, etc. Some of these operations are shown in the view of the heavy casting cleaning section in Fig. 4. Cleaned and finished castings are heat treated in a car type furnace. After cooling they are abrasive blasted, inspected and placed in the shipping department.

Cleaned and Heat Treated

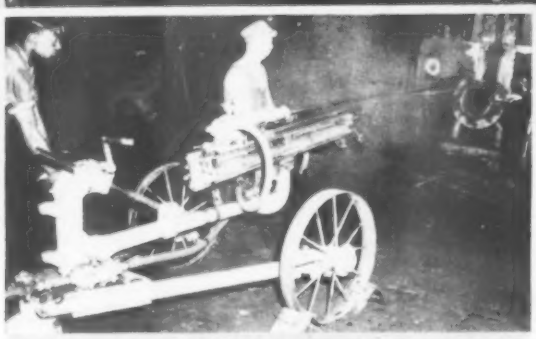
Small and medium weight castings are cleaned and finished in a separate section of the cleaning department; the section is arranged to permit rapid and easy handling of such castings. Those castings are placed in tote boxes, following cooling after shakeout, and transported to the small casting cleaning bay. The cycle of cleaning operations is quite similar to that for the heavy castings. They first are cleaned in abrasive-blast tumbling units to remove the sand. Then the risers and gates are burned off, except in the case of light sections which can be sheared off with a power sprue cutter. The castings are rough ground and chipped and then finish ground.

Heat treatment of the small and medium weight castings is performed in two circular type, oil-fired furnaces installed mainly below the floor level. They are 48 in. in diameter and 48 in. deep. Castings are placed in baskets which hold about 6000 lb. Heat treatment temperature is 1650 F., and the castings are held in this furnace for about 5½ hours. At the end of that period the basket with its load of castings is lifted out and placed in an insulated cooling pit. Castings remain in the cooling pit until they reach 1000 F, whereupon they are removed, as shown in Fig. 5, and cooled in

(*Continued on page* 246)

KNOCK 'EM OUT
2 to 8 times faster with the
CLEVELAND MOGUL-

The Mogul set up for removing cores from a 14-ton casting.



On castings weighing 500 lbs. or more, the Cleveland Mogul Core Breaker has proved itself a phenomenal time-and-money-saver. Consisting of a husky pneumatic hammer, mounted on wheels for mobility, its powerful ramming, hammering, and bit rotation quickly break up the hardest, most heavily rodded cores. In addition to its remarkable speed and ease of operation, the Mogul permits cleaning of much hotter castings, often one day earlier than usual.

SPECIFICATIONS

Length	9'-3"
Weight	1200 lbs.
Weight crated for Shipment	1450 lbs.
Wheel Gauge	4'-8½"
Maximum boom height (to center line of drill bit)	6'
Air required to operate continuously	200 cu. ft.

Operating crew—Two. One man controls feed and hammer and swings boom from side to side. The other operator turns the crank for raising and lowering the boom.

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Send for Bulletin 94

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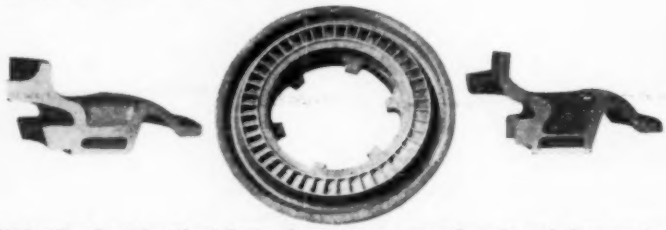
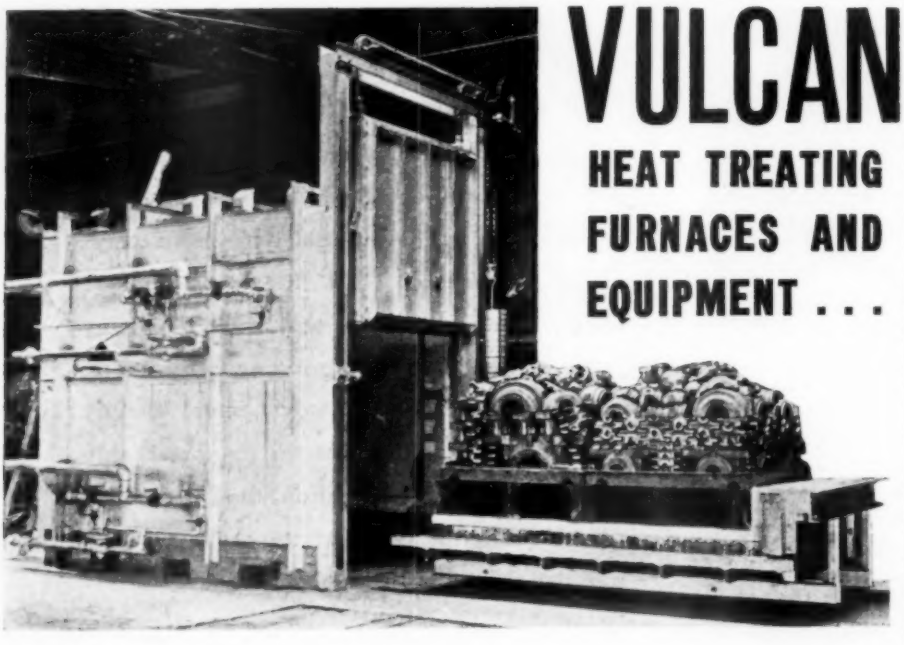
- Manufacture of Centrifugal Castings



High Alloy Steel Centrifugal Casting showing cross sections formerly made from a series of forgings. Thin section 1/16-inch—100 per cent X-Ray Inspection.

W. G. REICHERT ENGINEERING CO.
1060 Broad Street —*Foundry Specialists*— Newark 2, N. J.



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1797 CHERRY STREET, PHILADELPHIA, PA.

(*Continued from page* 244)

air. Baskets used for holding the castings are made of plain carbon steel and last about 75 heats.

Steel is melted in a 3-ton electric arc furnace located at the far end of the molding bay. Charges weigh about 8000 lb. and are composed of purchased scrap, returns and heads and gates. The percentages of the components vary according to the carbon desired in the bath at melt down. Total melting time for a charge from the time power is turned on until metal is tapped out is about 1 hr. and 20 min. Metal is put into the furnace by top charging, as shown in Fig. 6.

Bottom of the bucket is composed of a series of hinged triangular segments which meet at a point in the center. Instead of using a mechanical latch or lock to hold the segments in place, each segment has a hook attached on the under side, and a short piece of rope wound around those and tied holds them securely together. When the bucket is suspended over the hot furnace interior, the rope burns through in a few seconds to permit the segments to drop and the contents of the bucket to be discharged. As may be noted in Fig. 6, the bucket has a wide flange near the top; this is necessary, since the bucket is placed in a deep pit in the floor while it is being filled with raw materials.

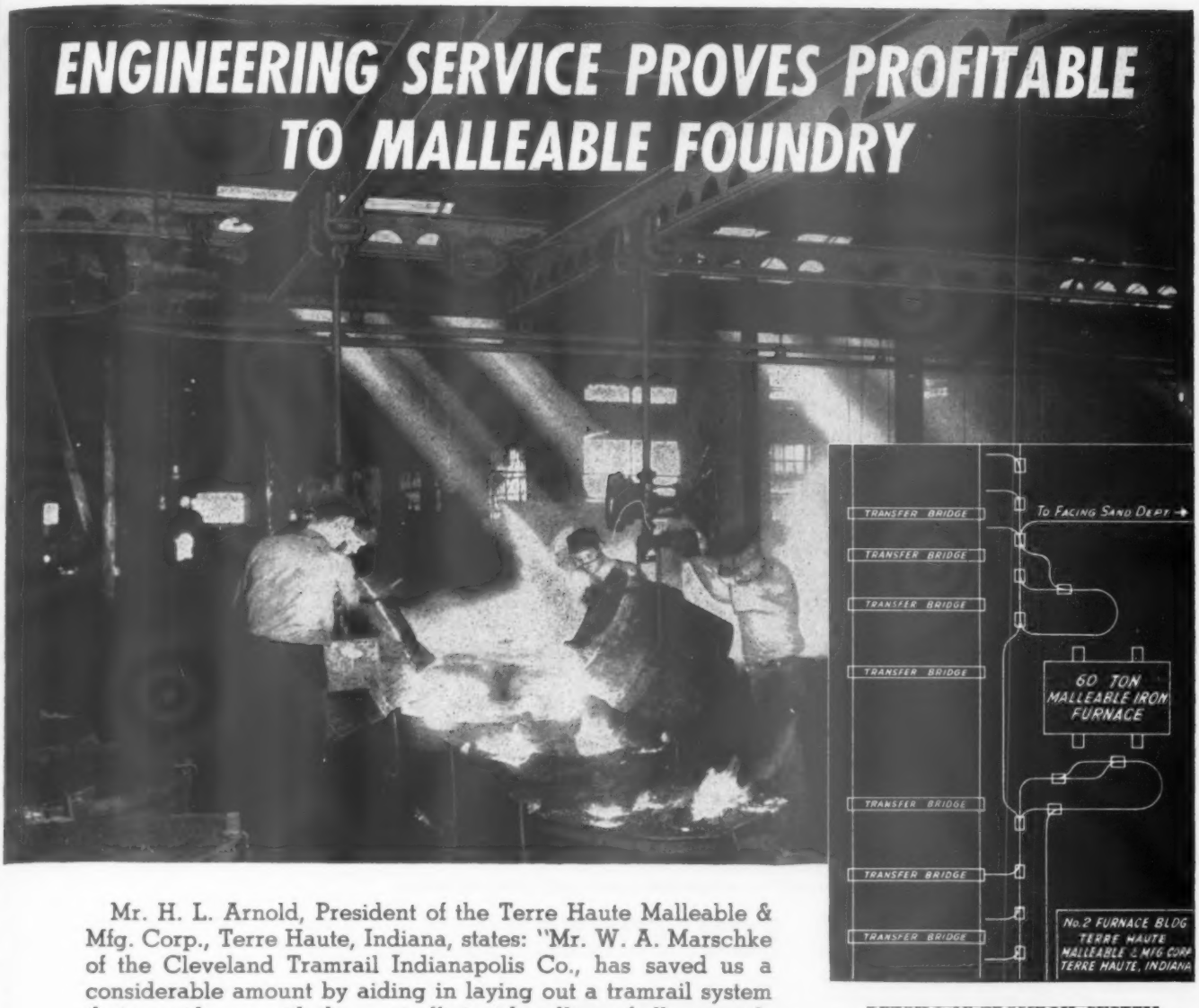
System Removes Smoke

In electric furnace operation, particularly during the meltdown period, plenty of black and brown smoke is evolved and escapes mainly around the electrodes, often creating a dense smudge around the furnace when atmospheric conditions are such that natural ventilation does not function properly. However, at Pelton Steel Casting Co. that condition never exists because the furnace top is equipped with an exhaust system which effectively removes all smoke. Part of the hooding may be observed on the furnace top in Fig. 6, with the take-off exhaust at the upper left of the furnace. The exhaust opening also extends over the side door of the furnace to remove heat and smoke during any operations conducted at that point. Exhaust is carried to a washing device before being discharged to the atmosphere.

Molten steel and slag is tapped from the furnace into a 4-ton ladle suspended in a pit in front of the furnace, as shown in Fig. 7. The ladle and its contents are transported by the crane to about the middle of the molding bay, where it is placed in trunnion supports, as depicted in Figs. 8 and 9. The ladle is the teapot-spout type, and the slag covering from the furnace acts as an excellent heat insulator at the point of greatest surface exposure. Molds are filled from two-man shank and bull ladles. In the case of the hand shanks, rests are provided to support them during filling, as shown in Fig. 8. As may be seen more clearly in Fig. 9 at the right of the trunnion support, the rests are three

(*Concluded on page* 248)

ENGINEERING SERVICE PROVES PROFITABLE TO MALLEABLE FOUNDRY



Mr. H. L. Arnold, President of the Terre Haute Malleable & Mfg. Corp., Terre Haute, Indiana, states: "Mr. W. A. Marschke of the Cleveland Tramrail Indianapolis Co., has saved us a considerable amount by aiding in laying out a tramrail system that provides us with the most efficient handling of all materials involved. We are well pleased with this engineering service."

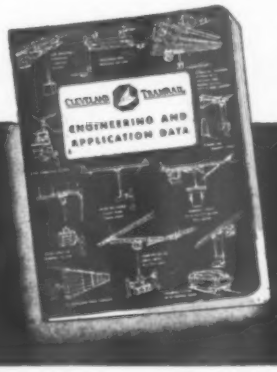
All Cleveland Tramrail representatives — in 60 offices throughout the United States and Canada — are experienced and qualified to render similar engineering service. They are familiar with many foundry installations; how to apply Cleveland Tramrail equipment to improve production, cut costs and secure other important advantages.

Terre Haute Malleable built their overhead tramrail system up on a step-by-step basis. Each step had to prove itself advantageous. Today their entire plant is covered with Cleveland Tramrail. Because the system has been carefully planned and engineered, top efficiency is being secured.

DETAILS OF TRAMRAIL SYSTEM

The metal from the 60-ton furnace is delivered directly to the molds, without rehandling, on the Cleveland Tramrail system shown in sketch. The ladles ride on easy rolling carriers on smooth overhead track that is above and away from where the dirt is most serious. The carriers are propelled onto transfer bridges that provide complete coverage of the pouring floor. The bridges are provided with interlocks that lock securely with discharge points on the rail spurs, permitting the safe transfer of the carriers.

In the photo above two 1000-lb. ladles are poured simultaneously in the production of 200-lb. malleable castings. Each ladle is handled on an individual transfer bridge.



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CONCO ENGINEERING WORKS
DIVISION OF H. D. CONKEY AND COMPANY
19 GROVE STREET — MENDOTA, ILLINOIS

(*Concluded from page 246*)

levels and consist of heavy lengths of pipe slidably fixed in ears attached to the trunnion supports. With that arrangement the rests can be pulled out or pushed in out of the way as required.

Pelton Steel Casting Co. maintains a small but well equipped laboratory for conducting the various chemical and physical testing examinations under which the modern steel castings foundry operates. In addition to the numerous preliminary and final chemical analyses conducted on the outgoing product, all incoming raw materials are examined for suitability in their specific application. The laboratory also contains equipment for sand control.

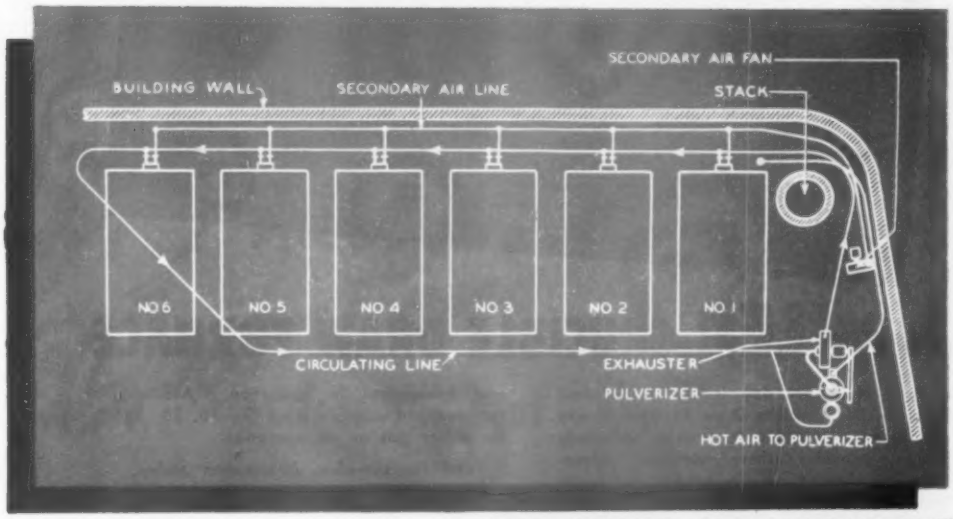
As mentioned earlier, the gangways and floors are kept clean at all times; this is accomplished without any great effort or hardship to any worker, since each takes a few minutes several times a day to clean up around his working area. That procedure, stressed and enforced by the management at the beginning, has become a routine performance. The employees take pride in seeing that their working areas are as clean as they can be, and recognize that it is a great aid in accident prevention. As a further aid in keeping all areas as free as possible from equipment not actually needed, all flasks, bottom boards, and jackets not in use are stored under cover in a large room adjacent to the molding bay.

At present, the firm is developing group incentive wage payments in various departments as a means of increasing its employe-management relationship as well as improving production smoothness and rate. First installation of the system was in the cleaning room about a year ago. That department had become a bottleneck in that the foundry was producing 40 to 50 tons more of castings a month than were being shipped. After careful study of the situation normal time requirements were developed for various operations and a group incentive plan worked out. The plan then was explained fully to the employees affected, and adopted on a trial basis. It met expectations of both management and employees, and has been followed since, with the result that the cleaning room keeps up with the molding department. Payment is based on time saved, 75 per cent going to the employees and 25 per cent to the firm, and is made to employees direct and indirect as a percentage of their earnings.

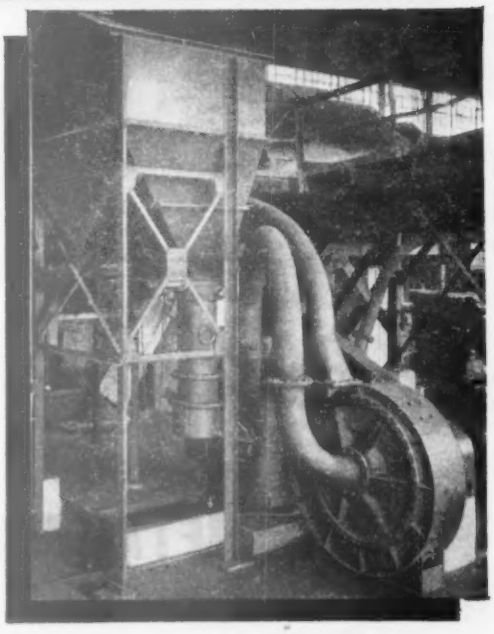
Publishes New List Of Standards

American Standards Association, 70 East 45th St., New York 17, has issued a new list of all its regular and war standards. Approximately 800 standards are included and relate to materials, methods of test, dimensions, definitions, procedures, etc., in the electrical, mechanical, building, transportation, textile and other fields.

SIX ANNEALING KILNS FIRED WITH PULVERIZED COAL



. . . by a *SINGLE* B&W PULVERIZER



The economical operation of a B&W Direct-Firing Pulverized-Coal Circulating System on five other kilns in the same plant proved the wisdom of firing these SIX kilns also with pulverized coal, using the circulating system.

Only ONE pulverizer is needed with this system because B&W Pulverizers are built to stay on the job and to pulverize their rated capacity in coal to the fineness necessary for the specific purposes.

With the B&W Direct-Firing Circulating System, space is efficiently used and interference with product-handling operations is avoided, since the pulverizer is placed where convenient and the pulverized-coal circulating line is looped overhead around the furnaces served. Complete flexibility in multi-furnace operation is obtained because as many take-offs to burners are provided as may be necessary and the burners may be turned on and off as desired. Kiln temperatures are controlled with the same ease, and by methods similar to those used with gas and oil firing.

For further details on pulverized-coal firing of metallurgical furnaces, write for a copy of B&W Bulletin 3-333.

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The Iler Crucible Draw Furnace is sturdy and compact in construction, low in first cost and economical in operation. Available for standard crucible sizes 50, 70, 90, 125 for either gas or oil operation.

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CUMULATIVE CURVE FOR SAND CONTROL

(*Continued from page* 101)

was applied to mechanical analysis in 1867. The use of graphs to represent sediments was started in 1892, as well as the use of the centrifuge in mechanical analysis. Air analyzers were introduced in 1906 and the continuous sedimentation balance in 1912. Methods using a manometer were introduced in 1918, the pipette method in 1922 and the hydrometer in 1927.

Dallavalle[16] has collected a large amount of material in his book *Micromeritics*. Chapter 3 on "Shape and Size Distribution," Chapter 4 on "Methods of Particle Size Measurement," Chapter 5 on the "Theory of Sieving and Grading Materials" and Chapter 6 on "Characteristics of Packings" are of particular interest to the foundryman. This is an excellent source of fundamental statistical information.

Investigators, in general, agree on measuring the clay sizes first, then removing the clay and analyzing the grain in a set of sieves. Several sets of sieves have been made which are satisfactory, the two most widely used in this country being the National Bureau of Standards and the Tyler systems. In these series each sieve varies in a definite manner from the next in size; that is, the linear dimensions along one side of the square openings multiplied by a constant gives the linear dimensions of one side of the opening in the next larger sieve. Dallavalle[16] discusses various sieve series in Chapter 5 of his book.

Cumulative Curve Is Graph

Cumulative curves[59, 60] can be used effectively to represent sand size and distribution. A cumulative curve is simply a graph, usually having particle size as the abscissa and per cent of material retained as the ordinate. They are called cumulative curves because the sieves are usually placed in sets or stacks, and to find the per cent coarser than any particular sieve the amounts retained on the sieve and on all the coarser sieve must be added together. This distinguishes it from the size frequency in which only the amount retained on each sieve is plotted against size. Fig. 1 shows a typical cumulative curve.

Analysis of the finer parts of sediments has been made in several ways. Trask[59, 60] used a centrifuge. Bouyoucos[5, 12] and Casagrande[13, 14] used hydrometers. Robinson [51], Krauss [29] and Jennings[23] developed the pipette method independently. Krumbein[30, 31], the American Society for Testing Materials[1], and Jackson[22] have discussed the use of the pipette. Oden[44] describes the use of manometers and specific gravity balances as well as the use of a continuous sedimentation balance which weighs the

(*Continued on page* 252)

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And "the best" in Chaplets, Chills and Superchills (patented) has long been identified with the fine old name of Fanner.
Today, more than ever, when there can be no compromise with either time or quality in turning out the best possible castings in the shortest possible time, the need for these vital Fanner products is a very essential "must" in every successful production speed-up.
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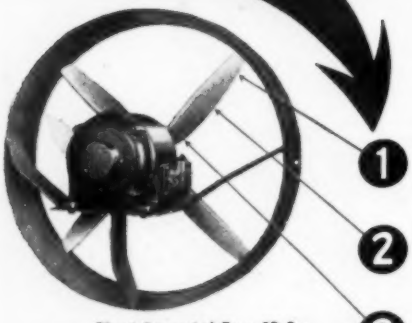

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(*Continued from page 250*)

sediment as it accumulates on a submerged pan. Hellman and McKelvey[21] describe an interesting combination of pipette and hydrometer which utilizes the best features of each.

Thoreen[58] discusses the hydrometer method in considerable detail with a very clear explanation of the underlying principles. The hydrometer method is based on the fact that when a sample of material, such as a molding sand, is mixed with water, it increases the density of the resulting suspension. When the suspension is allowed to stand, the particles settle out according to Stokes' law and the density of the suspension gradually approaches the density of the suspending medium. The amount of material in suspension at any time at the location of the hydrometer bulb is found from the hydrometer reading and the size is found by using the depth of the bulb and the settling time in the Stokes' law equation. The details are discussed later. The hydrometer procedure used by the Department of Agriculture, Bureau of Public Roads, is described by Wintermeyer, Willis and Thoreen[64]. Willis, Robeson and Johnson[63] describe a graphical method of correcting the data and Barber[4] developed a slide rule for making the corrections.

Difficulties Common To All

When many of these articles have been carefully read some salient facts appear:

a. The difficulties of the foundryman in the study of sand are no different from those of the oil man, the road builder or any other user of sediments of particulate materials.

b. A great amount of work has been done by workers in allied fields on the determination of particle sizes and their representation.

c. Methods have been developed by them which are faster and produce more information than the method developed and standardized several years ago by the AFA.

d. It would be well to modify foundry sand laboratory methods for two reasons, first to save time, and second, to get more information about our sands and thus lay the foundation for more accurate control, and, therefore, better and cheaper castings.

Experimental Work. In order to evaluate the convenience and utility of methods cited above and in the appendix, it was decided to try some of the more promising methods at the Naval Research Laboratory.

The first method to come under scrutiny was the pipette method described by Jackson[22]. He used a 50-g sample of dried sand which is added to a solution made up of 475 ml of distilled water and 25 ml of a 3 per cent solution of NaOH. This mixture is then dispersed with an electric stirrer mounted on a mason jar with baffles. The mixing period is five minutes. The sample is then transferred to a graduate and distilled water added to make one liter. The graduate is

(*Continued on page 254*)

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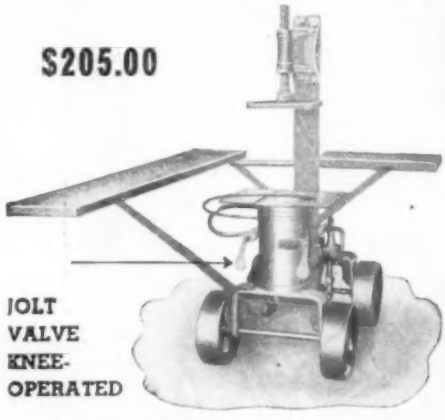

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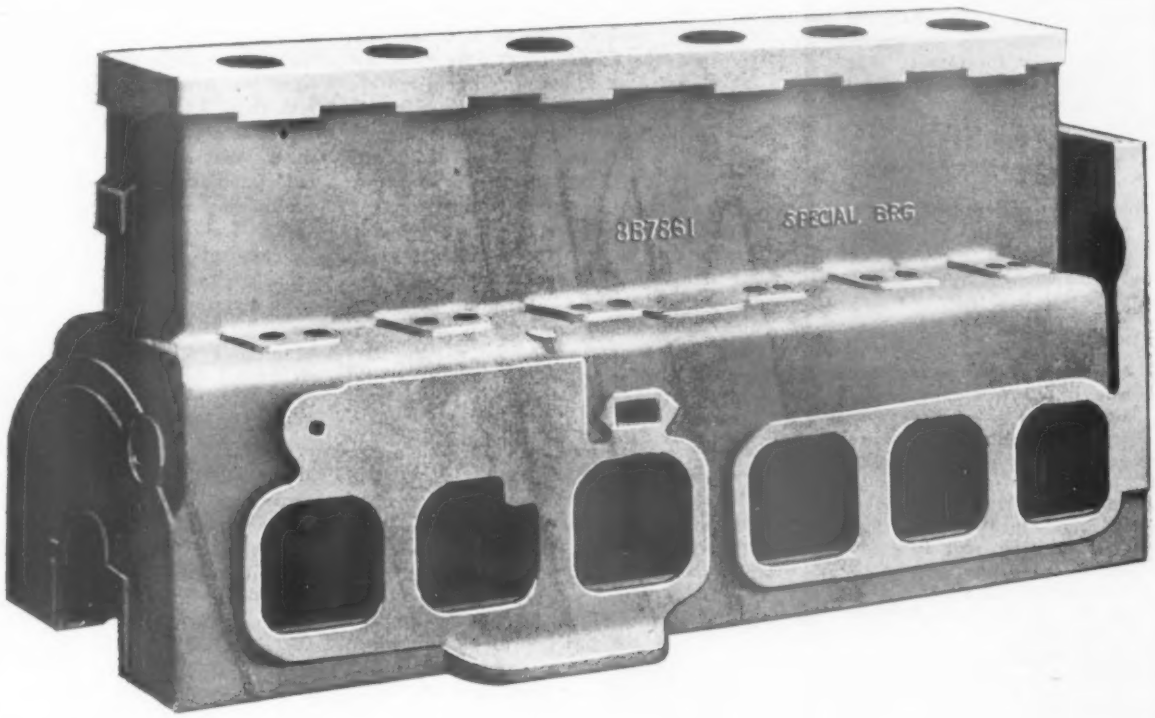

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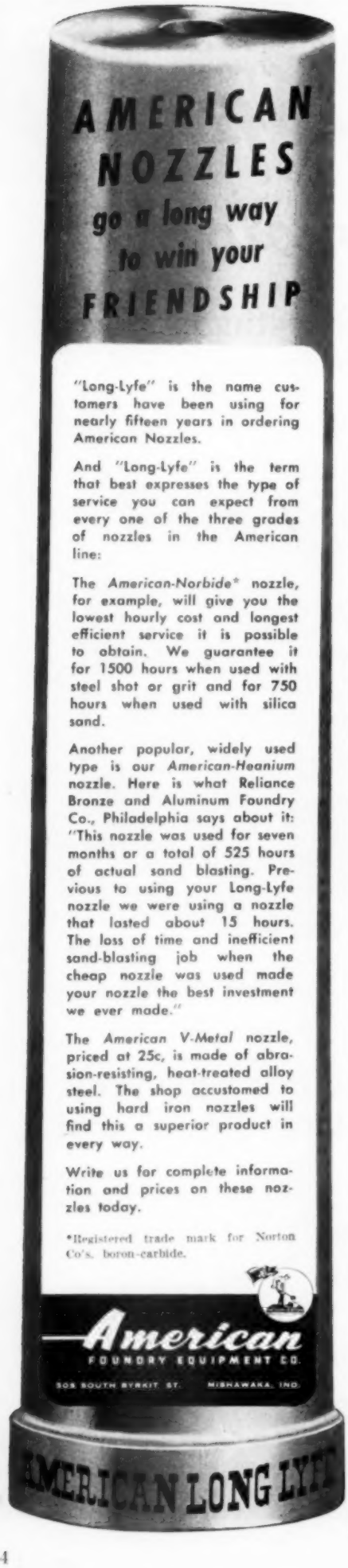
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(*Continued from page* 252)

up-ended several times to place all the sand and clay in suspension, after which it is placed on a table and a stop watch started. At some time after the beginning of the sedimentation period, which is determined by the size of separation wanted and the temperature of the suspension, a 25 ml pipette is inserted into the liquid to a depth of 5 in. and a sample removed and placed in a weighed evaporating dish. The sample is then evaporated to dryness and reweighed, the weight of dry clay plus NaOH is determined by difference and the weight of NaOH is subtracted, leaving the weight of clay in the pipette sample. Multiplying this amount by 80 gives the percentage of material finer than the size for which the test was made.

A nomographic chart Fig. 10, is included in this report which allows the settling time to be determined readily from the temperature and the size of separation desired. This method has been used successfuly for several years at the Naval Research Laboratory but is not entirely satisfactory. It requires a sensitive analytical balance to weigh the evaporating dishes. The evaporating dishes are cooled in a desiccator after drying and, during weighing, begin to absorb moisture from the air, making weighing difficult. The ground glass covers are closed when the sample is removed for weighing and this eliminates the adsorption of water and increases accuracy. This method is time consuming and tedious if many determinations are required. It has one important advantage over the AFA method in that determinations may be made at several sizes, thus providing data for cumulative curves in the clay region. This is important because it is due to the material in this region (less than 50 microns) that sand troubles often develop.

Plot Sieve Data

During the time the pipette method was in use, the practice of plotting sieve data as cumulative curves was adopted, and proved so much superior to the histograms previously used that they are now employed exclusively. A typical plot, sometimes called a *weight accumulation curve* is shown in Fig. 2. Krumbein[33] has discussed the advantages and significance of this method. Trask[59] used it in his study of sediments in connection with the search for oil bearing deposits. The median and quartile values used by Trask, as well as his method of determining distribution and skewness, are of considerable interest and are similar to methods described by Morey and Taylor[42] even though their methods were developed without knowledge of the previous work of Trask in the petroleum field.

Briefly, Trask's method is to plot his data on semi-log graph paper as a cumulative curve using *per cent retained* as ordinate and *particle size* as abscissa. The particle sizes at which the curve crosses the 25, 50 and 75 per cent retained lines are then read from the abscissa (usually in microns). These points are called the first quartile, median size and third quartile. The median size is a very useful measure of particle size since 50 per cent by weight of the grains are larger and 50 per cent are smaller than this value. Morey and Taylor[42] called this *center grain size*. Trask and Morey and Taylor both used the ratio of the size at the first quartile to that at the third as a means of representing distribution and Trask went a step further in taking the square root of this ratio which he calls *coefficient of sorting*:

$$So = \sqrt{\frac{Q_1}{Q_3}}$$

Q_1 and Q_3 being the grain size at the first and third quartiles respectively. This is illustrated in Fig. 3.

Trask's formula for *coefficient of skewness, Sk*, is:

$$Sk = \frac{Q_1 \times Q_3}{M^2}$$

This represents the ratio of the slope in the second quartile interval to that in the third quartile intervals. If *Sk* is 1, the sand has a normal distribution. If *Sk* is less than 1, the sand is skewed to the right. If a sand is skewed to the left it means that the mode, or maximum concentration of particles lies to the left of the median or to the coarse side and vice versa. Trask shows that a skewness coefficient of .67 and 1.50 represent the same amount of divergence of the mode from the median but in opposite directions.

In order to avoid any erroneous impression from this fact he uses the logarithm of the coefficient of skewness. The log of 0.67 is minus 0.18 and the log of 1.50 is plus 0.18. Thus, instead of varying about unity the logarithms vary about zero, negative values indicating skewness to the left and positive values to the right. Trask's data[59] (Table 6-pp.292-295) show the quartiles Q_1, M and Q_3, the coefficient of sorting *So*, the coefficient of skewness, *Sk*, and log skewness, *Log Sk*. He classified particle size of sediments as follows:

Larger than 1000 microns	gravel
From 50 to 1000 microns	sand
From 5 to 50 microns	silt
From 1 to 5 microns	clay
Smaller than 1 micron	colloidal clay

This is a very logical nomenclature and might prove to be useful for foundry terminology.

From Trask's data it is possible to reconstruct cumulative curves to show the texture of his samples. Some of these are shown in Fig. 5. These curves also serve to illustrate the variety of sediments as they occur in nature. Trask's values are shown in Table V, page 256.

Fig. 6 shows some of the sands used as a base for steel molding sand mixtures. Statistical data on these sands are shown in Table IV. Comparing these curves with Fig. 5 shows at once the outstanding differences between natural deposits and washed and graded sands. While the median size may be similar, the distribution, or sorting, has been changed considerably in the washing and sorting process, one sand deposit being sorted into

(*Continued on page* 256)

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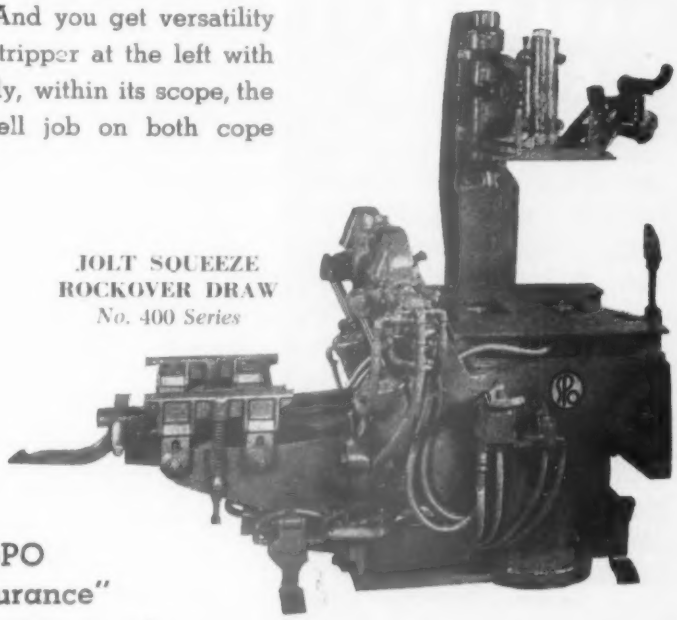

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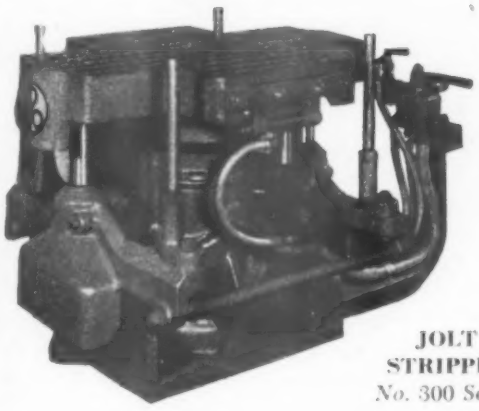

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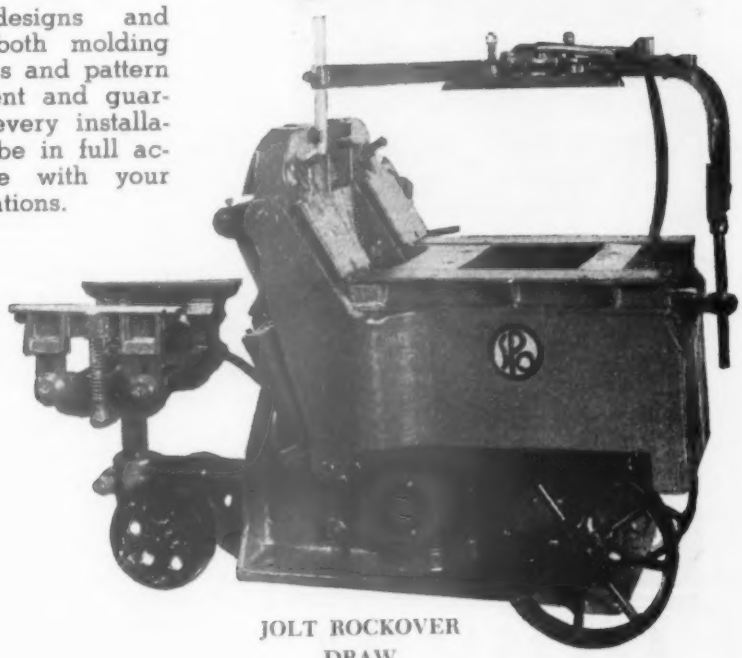

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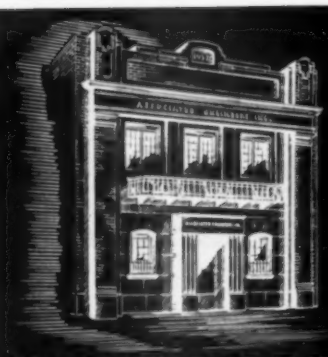

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(*Continued from page* 254)

four or more grades of sand in addition to the gravel and silt, most of which is discarded.

In examining these curves in detail we note that they cover most of the range of sand fineness which is commonly used in steel molding sand mixtures. The sizes range from 109 to 475 microns. The coefficients of sorting are all below 1.50 which indicates that the materials are extremely well sorted when compared with the normal sediments (Fig. 5) which have sorting coefficients as high as 4.80. These skewness coefficients range from 1.05 to 0.95 which indicates relatively little skewness. Visual examination shows the curves to be symmetrical with no abnormalities.

Interesting in connection with the discussion of skewness are the sands shown in Fig. 8. They are steel molding sands which have been through a hydroblast installation, the coarse sand being reclaimed sand which is normally rebonded and used over and the finer sand is the portion normally discarded as fines. The similarity, illustrated in Fig. 9, of the fine sand to Albany sand was noted and, to determine if it would serve the same purpose, the material was bonded with a small amount of bentonite and dextrine and used to make a brass casting. It produced very good results and might be used for light work in any metal except magnesium.

Refuse Is Good Sand

The curves themselves show considerable skewness in opposite directions. This is the result of a fairly efficient *split* or separation in the hydraulic separating unit. The coarse fraction contains more than half of the grain material and comprises the *toe* of the curve before the separation was made. It is skewed slightly to the right. The fine portion is skewed to the left and contains that material which formed the shoulder of the cumulative curve prior to separation. It is surprising to note that this material, believed to be worthless fines with a very large amount of inert clay actually has only 21 per cent silt and less than 3 per cent clay. The remaining 76 per cent is good grain material.

After Jackson's method was used for some time to make a 20 micron determination, the need was felt for more points on the cumulative curve in the fine end, so the pipette method was used for other sizes as well, using the nomographic chart in Jackson's paper and reproduced here as Fig. 10. Determinations were usually made at 10, 5 and 2 microns. The results produced were good but the work was very tedious and time consuming if many points were to be determined. To simplify testing, several hydrometers were obtained and tried for the determination of clay. It soon became apparent that a hydrometer for this purpose would have to be very sensitive. A Bouyoucos hydrometer was obtained and his method [5,12] was tried. His directions include determinations at 50, 5 and 2 microns. The agreement with the pipette method at 50 and 5 microns was good but at 2 microns results did not check. It was then decided to investigate some of the more precise methods.

The method of the Bureau of Public Road [64, 58, 4] was tried and found to give very rapid results. The equipment used in this method is shown in Fig. 4. Considerable care is needed in maintaining constant temperatures. When the hydrometer is placed in the suspension it does not always float at the same height. As the particles settle toward the bottom, the remaining suspension becomes less dense and the hydrometer settles deeper. This causes a difference in the depth of settling which is used in the calculations. This consideration is discussed in detail later.

Describes Operating Details

Briefly the technique for using this method is as follows: 50g of dry sand is weighed and transferred to an electric stirrer. 500 ml of distilled water and 5 ml of normal sodium silicate solution is added. This is stirred for five minutes and transferred to a 1-liter cylindrical graduate. To facilitate transfer, a bottle filled with distilled water is used having a connection to the compressed air line, a vent, and a jet. When the bottle is picked up, placing one finger over the vent causes air pressure to build up inside and a long thin stream of water to flow from the jet which quickly washes all material from the stirring cup to the graduate. Distilled water is then added to make 1 liter. The graduate is placed in a constant temperature tank (desirable but not essential) at 67 F. When it is at temperature, the graduate is removed and up-ended until all material is in suspension and well mixed. It is then returned to the constant temperature bath and a stop watch is started. Up to this point the method is very similar to Jackson's except that a different deflocculant is used.

When the cylinder has been returned to the tank and the timer started, the hydrometer is inserted and the first reading taken as soon as it comes to rest. The hydrometer is read at the top of the

(*Continued on page* 258)

TABLE V—Data Reported by Trask in Study of Sediments

Sample	143B	174A	207A	270A	338	377	405	467	484
Q_1	115	9.5	13	215	15	225	60	550	28
M	16	5.8	5.5	150	4.8	180	25	190	6.6
Q_3	5	1.6	1.1	62	1.3	80	3.7	48	1.8
So	4.80	2.44	3.44	1.86	3.30	1.70	4.04	3.38	3.94
Sk	2.25	.61	.47	.59	.85	.56	.36	.73	1.12
Log Sk	.35	—.22	—.32	—.23	—.07	—.26	—.45	—.14	.05
Gravel	4	0	0	11	Trace	0	Trace	11	0
Sand	28	2	10	68	3	81	29	63	15
Silt	43	48	46	6	45	10	40	9	42
Clay	25	35	23	7	34	7	26	15	29
Colloid	0	15	21	8	18	2	5	2	14

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(*Continued from page* 256)

meniscus because the suspension is not transparent but the error introduced is slight and is roughly balanced by the effect of the sodium silicate used as a deflocculant. Usually the first reading can be made within 30 seconds. Successive readings are then taken at intervals to give the number of determinations desired. The hydrometer readings and corresponding settling times are then used to determine percentages[58] and size in two separate steps by the following formulas:

$$P = \frac{(R \text{ plus } \triangle R)\ a \times 100}{W}$$

where P = percentage of originally dispersed sample remaining in suspension
R = hydrometer reading
W = weight of sample
$\triangle R$ = Correction to hydrometer reading for variation in temperature from 67 F.
a = Correction coefficient for variation in specific gravity from 2.65.

$$\text{and } d = \sqrt{\frac{30\ nL}{980\ (G—G)\ T}}$$

where d = maximum grain diameter in millimeters in suspension at any given time after dispersion.
n = coefficient of viscosity of the suspending medium, in poises
L = average distance in centimeters through which the particles settle in a given time
T = period of sedimentation in minutes
G = specific gravity of particles
G_1 = specific gravity of the suspending medium

If a constant temperature tank at 67 F. is used $\triangle R$ may be omitted and if the specific gravity is near 2.65 as in the case of most of the sands used for molding, a may be omitted. W is usually 50 so the first formula reduces to $P = 2R$; that is, the reading of the Bouyoucos hydrometer is multiplied by two.

In the second formula, if T is held at 67 F. n is 0.0102 poise, G is 2.65 and G_1 is 0.99841. The formula, therefore, reduces to:

$$d = \sqrt{\frac{30 \times 0.0102 \times L}{980\ (2.65—0.99841)\ T}} = \sqrt{\frac{.000189\ L}{T}}$$

If d is desired in microns instead of millimeters

$$d = \sqrt{\frac{189\ L}{T}}$$

L must be determined for each hydrometer. When employing a Bouyoucos hydrometer Thoreen[58] uses 0.42 of the immersed depth and for the specific gravity type hydrometer a value equal to the depth from the free surface to the center of the submerged volume. It is believed that the latter method is better in either case. This distance may be found by filling a cylindrical graduate partly full of water, reading the volume, inserting the hydrometer to some particular hydrometer value, reading the volume on the graduate again, and then withdrawing the hydrometer until the water level on the graduate goes halfway down to the first reading. Hold the hydrometer at this position and measure the distance in centimeters from the water surface to the particular hydrometer reading which was selected. This distance is the L corresponding to that reading. If three or four such points are determined for each hydrometer a curve may be drawn, giving L as a function of the

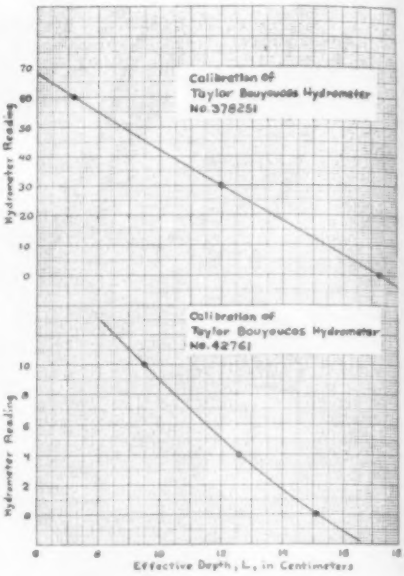
Calibration of Taylor Bouyoucos Hydrometer No. 378251
Calibration of Taylor Bouyoucos Hydrometer No. 42761
Hydrometer Reading
Effective Depth, L, in Centimeters

Fig. 12—*Calibration curves for two hydrometers*

reading. Fig. 12 shows the relation for two of the hydrometers used at the Naval Research Laboratory.

In order to simplify calculations a chart was made to show the relationship between T, L and d. It is shown as Fig. 11 and is derived from Stokes law[58].

By using the two charts the hydrometer method becomes very simple, consisting of the following steps:

a. Reading the hydrometer and the corresponding settling time.

b. Determining L from the curve for the hydrometer used (Fig 12).

c. Using the settling time and L, determining the size in microns from the chart (Fig. 11).

d. Determining the percentage of material finer than the size in microns by multiplying the hydrometer reading by two.

e. When several points have been determined, the clay is siphoned off, the sample dried, and sieved in the usual way. The sample can be siphoned to a depth of 12 in. after settling four minutes. This is repeated until the suspension is clear after four minutes. The water is decanted, the grain dried, and sieved in the usual way.

f. A cumulative curve of the sieve data is plotted using the hydrometer determinations in the silt clay range to com-

(*Continued on page* 260)

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(*Continued from page* 258)

plete the curve. If cumulative percentages retained are used, each hydrometer percentage must be subtracted from 100 to put them on the same basis.

A hydrometer of the type used by Hellman and McKelvey[1] was made and tried. It has the advantage that the sample may be withdrawn from any desired depth. *L*, therefore, is predetermined instead of variable. The density of the sample in the pipette is approximately constant, so any error which might be caused by variation in the density of the suspension from top to bottom of the hydrometer is eliminated. If temperature variations are corrected, this makes a simple tool for rapid routine clay determinations but from the tests conducted to date the regular Bouyoucos hydrometer and the technique described previously gives more consistent results.

Since the cumulative curve method, in conjunction with hydrometer analysis, has been in use at the Naval Research Laboratory, several varied uses have been made of it which are indicative of the many further applications which can be found as familiarity with the method develops. Some of the uses made to date are:

a. To give essential information on sands, particularly in the silt-clay region where mysterious troubles sometimes develop. Such troubles as are attributable to particle size can be immediately determined. More often than not such is the case if fairly standard brands of raw materials are used.

b. For specifying sands, silica flours, clays, blast grit, grinding compounds, and similar raw materials. This application has been limited because of the inability of the supplier to provide complete analyses. However, many times it has been possible to describe requirements in terms of materials previously supplied and to indicate use of longer or shorter grinding times or different sieve sizes, to obtain useful results. Acceptance of this method as standard practice for particulate materials would simplify specifications.

c. Various grades of silica flour which perform differently in practice, have been checked, reasons for their differences readily disclosed, and correction made.

d. Many commercial products marketed as highly specialized materials have given up their secrets when examined by this method.

e. One of the latest applications has been in the study of the powdered refractory materials used as investments for precision casting. It has been possible to synthesize mixtures, thereby reducing cost and eliminating purchase of seemingly strategic materials.

f. Fig. 13 shows an interesting application in the study of removal of fines from a molding sand. It was necessary to test a machine for its ability to remove such fines and it was not possible to collect the material which was removed. Silica flour (Curve *B*) was added to heap sand (Curve *A*) to produce a mixture high in fines (Curve *C*). Curves *D* and *E* show the progressive removal of the fines with operating time. This is about the only technique which would accurately indicate the changing texture of the sand.

The use of cumulative curves at the Naval Research Laboratory for illustrating the particle size and distribution of foundry sands and clays has proved definitely superior to the AFA grain fineness number ordinarily used for this purpose. Sieve data for the coarser sand grains and the result of hydrometer analysis of the finer clay and silt are used in a single curve to give a comprehensive description of the material. This technique has proved particularly useful for specifying, controlling, and understanding foundry sands, clays,

(*Continued on page* 262)

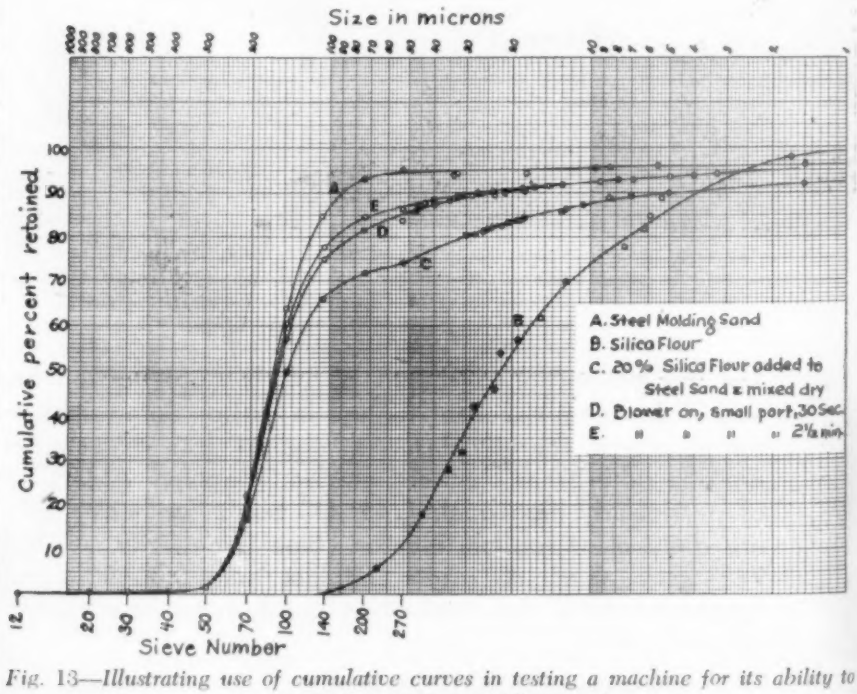
Size in microns
Cumulative percent retained
Sieve Number
A. Steel Molding Sand
B. Silica Flour
C. 20% Silica Flour added to Steel Sand & mixed dry
D. Blower on, small port, 30 Sec.
E. " " " 2½ min.

Fig. 13—Illustrating use of cumulative curves in testing a machine for its ability to remove fines from a molding sand

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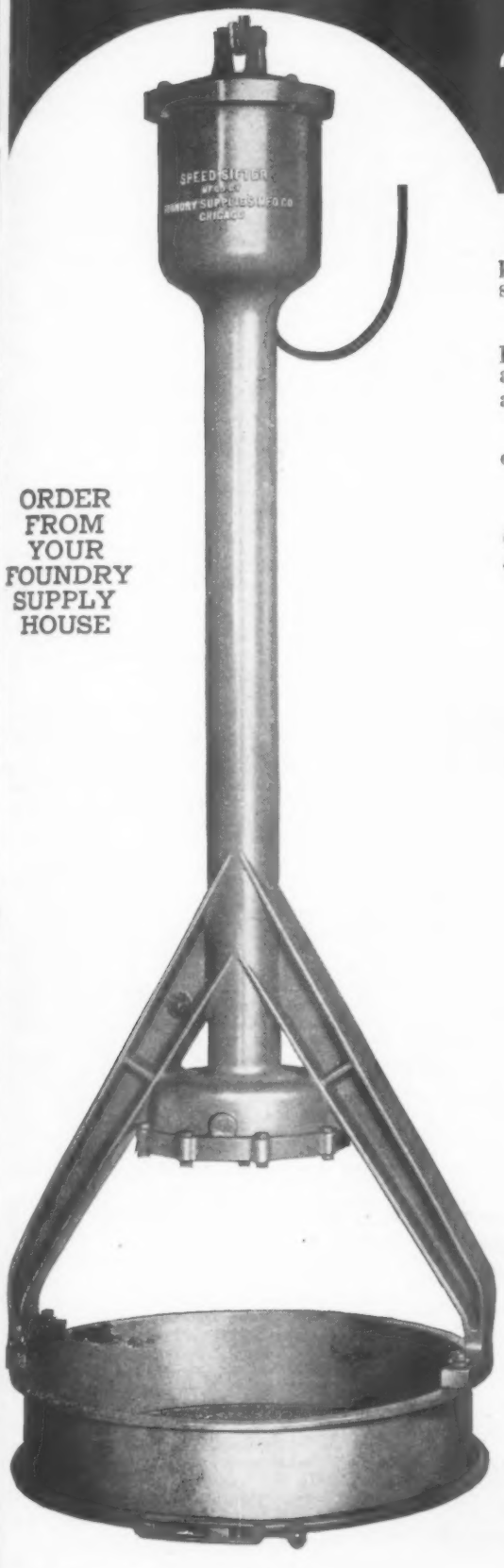

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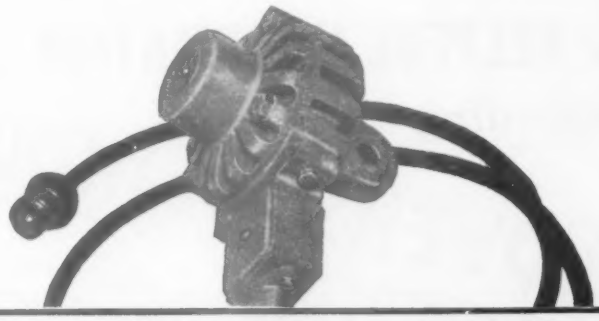

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(*Continued from page 260*)

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It is believed that the present standard AFA grain fineness method does not give sufficient information about sands, and that it should be replaced by the methods described in this report. This would permit more accurate control of molding sand mixtures, simplify the selection and specification of molding sands and similar foundry raw materials, and permit the interchange of information on a more accurate and scientific basis.

Acknowledgment. The authors wish to thank the Navy Department for sponsoring the work and for permission to publish the results.)

BIBLIOGRAPHY

1. Standard Method of Mechanical Analysis of Soils. ASTM Designation D422-39, American Society for Testing Materials, Vol. 39, part II, pp. 453 - 62 (1939).

2. Symposium on New Methods for Particle Size Determination in the Subsieve Range. ASTM, Washington Spring Meeting, March 4, 1941, published Philadelphia 1941, 120 pp. Ceramic Abstracts, Vol. 21, No. 4, p. 92 (1942).

3. Bagnold, Ralph A. The Physics of Blown Sands and Desert Dunes, 265 pages, 16 plates, 84 diagrams. Published by William Morrow & Co., New York.

4. Barber, Edward S. "Simplified Computation of Hydrometer Test Data for Soil," *Public Roads* Vol. 20, No. 1, March 1939, pp. 13-17.

5. Bouyoucos, G. J. "The Hydrometer as a New and Rapid Method for Determining Colloidal Content of Soils," *Soil Science* Vol. 23, pp. 319-30 (1927).

6. Bouyoucos, G. J. "The Hydrometer as a New Method for the Mechanical Analysis of Soils," *Soil Science*, Vol. 23, pp. 343-353 (1927).

7. Bouyoucos, G. J. "A Comparison of the Hydrometer Method and the Pipette Method for Making Mechanical Analysis of Soils," *Journal* of the American Society of Agronomy, Vol. 23, No. 4, August 1930.

8. Bouyoucos, G. J. "Studies on the Dispersion Procedure Used in the Hydrometer Method for Making Mechanical Analysis of Soils," *Social Science*, Vol. 33, pp. 21-26 (1932).

9. Bouyoucos, G. J. "Comparison Between Pipette Method and Hydrometer Method for Making Mechanical Analyses of Soil," *Soil Science*, Vol. 38, pp. 335-43 (1934).

10. Bouyoucos, G. J. "Directions for Making Mechanical Analyses of Soils by the Hydrometer Method," *Soil Science*, Vol. 42, pp. 225-228 (1936).

11. Bouyoucos, G. J. "Sensitive Hydrometer for Determining Small Amounts of Clay or Colloids in Soils," *Soil Science*, Vol. 44, pp. 245-6 (1937).

12. Bouyoucos, G. J. "The High Degree of Accuracy of the Improved Soil Hydrometer Used in the Mechanical Analysis of Soils," *Soil Science*, Vol. 44, pp. 315-317 July, Dec. 1937.

13. Casagrande, A. "Hydrometer for Determination of Fineness Distribution of Soils," Julius Springer, Berlin, 1934.

14. Casagrande, A. "Hydrometer Method for Grain Size Tests," *Journal* American Ceramic Society, Vol. 22, No. 9, p. 288 (1939).

15. Clark, C. L. "The Dispersion of Soil-Forming Aggregates," *Soil Science*, Vol. 35, pp. 291-294 (1933).

16. Dallavalle, J. M. "*Micromeritics, the Technology of Fine Particles.*" Pitman Publishing Co., New York, p. 428 (1943).

17. Davis, R. O. E. "Colloidal Determination in Mechanical Analysis," *Journal* American Society Agronomy, Vol. 17, pp. 275-279 (1925).

18. Davis, R. O. E. and Middleton, H. E. "Dispersion of Soils for Mechanical Analysis," Proceedings of the First International Congress for Soil Science, pp. 366-377 (1928).

19. Eno, F. H. "A Decade of Progress in Highway Research," Engineering Experiment Station Bulletin No. 20, Ohio State University, March 1930.

20. Hauser. "Separation and Fractionation of Colloidal Systems," *Industrial and Engineering Chemistry*, Vol. 32, No. 5, pp. 659-62 (1940).

21. Hellman, N. N. and McKelvey, V. E. "A Hydrometer Pipette Method for Mechanical Analysis," *Journal of Sedimentary Petrology*, Vol. 11, No. 1, pp. 3-9, April (1941).

22. Jackson, C. E. and Saeger, C. M. Jr. "Use of Pipette Method in the Fineness Test of Molding Sand," National Bureau of Standards Research Paper R P 757.

23. Jennings, D. S., Thomas, M. D., and Gardner, W. "A New Method of Mechanical Analysis of Soils," *Soil Science*, Vol. 14, pp. 485-99 (1922).

24. Joseph, A. F., and Snow, O. W. "The Dispersion and Mechanical Analysis of Heavy Alkaline Soils," *Journal* Agric. Science, Vol. 19, pp. 106-120, 1929.

25. Joseph, A. F. "The Determination of Soil Colloids," *Soil Science*, Vol. 24, pp. 271-274 (1927).

26. Keen, B. A. "Some Comments on the Hydrometer Method for Studying Soils," *Soil Science*, Vol. 26, pp. 261-3 (1928).

27. Koenig, J. H. "Particle Size Distribution of Ingredients versus Body Properties," *Bulletin* American Ceramic Society, Vol. 19, No. 11, pp. 424-30 (1940).

28. Koenig, J. H. and Henderson, T. C. "Particle Size Distribution of Glazes," *Journal* American Ceramic Society, Vol. 24, No. 9, pp. 286-97 (1941).

29. Krauss, G. "Ueber eine Neue Methode der Mechanischen Bodenanalyse," *Int. mitt. fur Bodenkunde*, Vol. 13, pp. 147-160, 1923.

30. Krumbein, W. C. "A History of the Principles and Methods of Mechanical Analysis," *Journal of Sedimentary Petrology*, Vol. 2, No. 2, pp. 89-124, August, 1932.

31. Krumbein, W. C. "The Mechanical Analysis of Fine Grained Sediments," *Journal of Sedimentary Petrology*, Vol. 2, No. 3, pp. 140-49, December, 1932.

32. Krumbein, W. C. "The Dispersion of Fine-grained Sediments for Mechanical Analysis," *Journal of Sedimentary Petrology*, Vol. 3, No. 3, pp. 121-135, December, 1933.

33. Krumbein, W. C. "Size Frequency Distribution of Sediments," *Journal of Sedimentary Petrology*, Vol. 4, No. 2, pp. 65-77, August, 1934.

34. Krumbein, W. C. "A Time Chart for Mechanical Analysis by the Pipette Method," *Journal of Sedimentary Petrology*, Vol. 5, No. 2, pp. 93-95, August, 1935.

35. Krumbein, W. C. "Application of Logarithmic Moments to Size Frequency Distribution of Sediments," *Journal of Sedimentary Petrology*, Vol. 6, No. 1, pp. 35-47, April, 1936.

36. Krumbein, W. C. "The Use of Quartile Measurements in Describing and Comparing Sediments," *American Journal of Science*, Vol. 32, pp. 98-111 (1936).

37. Krumbein, W. C. and Tisdel, F. W. "Size Distribution of Source Rocks of Sediments," *American Journal of Science*, Vol. 238, pp. 296-305.

38. Krumbein, W. C. and Pettijohn, F. J. *Manual of Sedimentary Petrography*, D. Appleton-Century Co., pp. 549 (1938).

39. Krumbein, W. C. "Size Frequency Distribution of Sediments and the Normal Phi Curve," *Journal of Sedimentary Petrology*, Vol. 8, No. 2, pp. 84-90, December, 1938.

40. Lyons, S. C. "Practical Aspects of Particle Size Control," *Bulletin*, American Ceramic society, Vol. 20, No. 9, pp. 303-309.

41. Mills, F. C. *Statistical Methods*. New York, p. 124 (1924).

42. Morey, R. E., and Taylor, H. F. "Some Properties of Synthetically Bonded Steel Molding Sands," *Transactions*, AFA, Vol. 49, pp. 388-426 (1941).

43. Norton. "Measurement of Particle Size in Clays," *Journal* American Ceramic Society, Vol.

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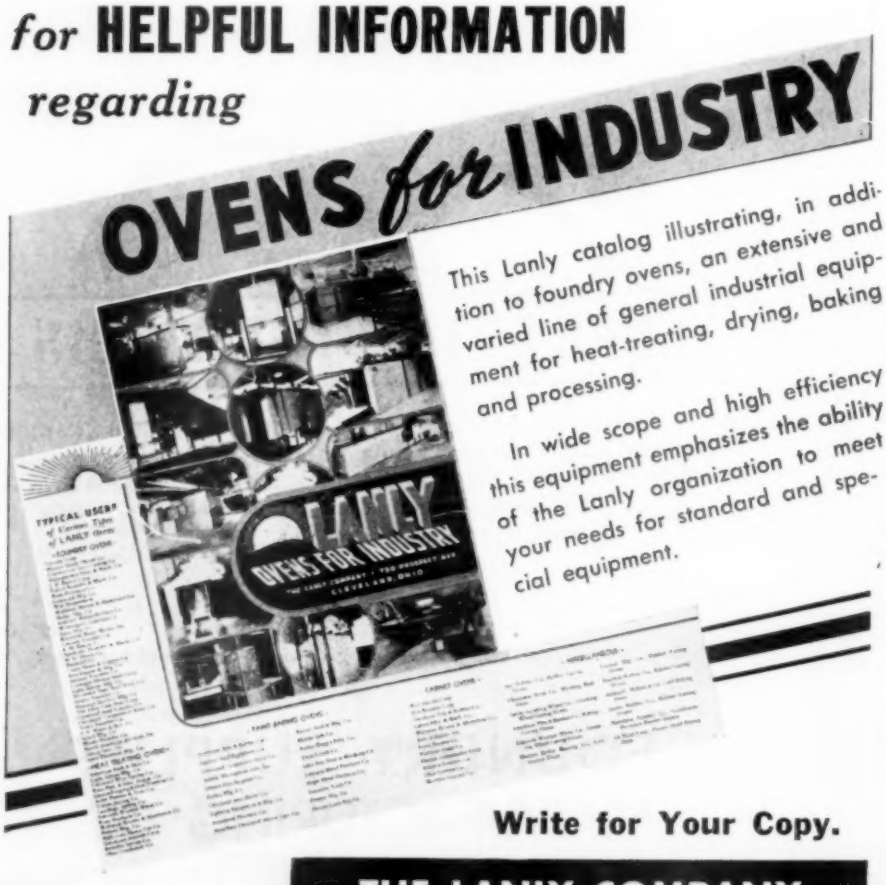
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21, No. 3, pp. 89-97 (1938).

44. Oden, Sven. "The Size Distribution of Particles and the Experimental Methods of Obtaining Them," *Soil Science*, Vol. 19, No. 1, pp. 1-35.

45. Olmstead, L. B., Alexander, L. T., and Middleton, H. E. "A Pipette Method of Mechanical Analysis of Soils Based on Improved Dispersion Procedure, U. S. Dept. of Agriculture Tech. Bulletin 170 (1930).

46. Olmstead, L. B. "Dispersion of Soils by a Supersonic Method," *Journal Agriculture Research*, Vol. 42, pp. 841-852, 1931.

47. Olmstead, L. B., Alexander, L. T., and Lakin, H. W. "The Determination of Clay and Colloid in Soils by Means of a Specific Gravity Balance," American Soil Survey Assoc., Bulletin 12, pp. 161-166, (1931).

48. Postel, A. Williams. "The Préparation of Clay Samples for Elutriation by Steam Agitation," *Journal of Sedimentary Petrology*, Vol. 3, No. 3, pp. 119-120, December, 1933.

49. Puri, A. N. and Keen, B. A. "The Dispersion of Soil in Water Under Various Conditions," *Journal Agricultural Science*, Vol. 15, pp. 147-161 (1925).

50. Rigden, P. J. "Measurement of the Fineness of Powdered Materials," *Chemistry and Industry*, 62 (42) 393-96 (1943).

51. Robinson, G. W. "A New Method for the Mechanical Analysis of Soils and Other Dispersions," *Journal Agricultural Science*, Vol. 12, pp. 306-321, 1922.

52. Roller, Paul S. "Law of Size Distribution and Statistical Description of Particulate Materials," *Journal of the Franklin Institute*, Vol. 223, pp. 609-33 (1937).

53. Roller, Paul S. "Size Distribution of Particulate Materials," *Journal of Physical Chemistry*, Vol. 45, pp. 241-81, 1941.

54. Roller, P. S. "Classification of Methods of Mechanical Analysis of Particulate Materials," *Proceedings*, ASTM, Vol. 37, part II, pp. 675-83 (1937).

55. Russell, R. Jr. and Weisz, R. S. "Some Particulate Characteristics of Commercial Flint and Feldspar," *Journal* American Ceramic Society, Vol. 27, No. 1, pp. 1-7, January 1944.

56. Schramm, "Particle Size Analysis of Clay by Sedimentation," *Journal* American Ceramic Society, Vol. 8, No. 4, pp. 243-52, (1925).

57. Thomas, M. D. "Replaceable Bases and the Dispersion of Soil in Mechanical Analysis," *Soil Science*, Vol. 25, pp. 419-427 (1928).

58. Thoreen, R. C. "Comments on the Hydrometer Method of Mechanical Analysis," *Public Roads*, Vol. 14, pp. 93-105 (1933).

59. Trask, Parker D. *Origin and Environment of Source Sediments of Petroleum*, Gulf Publishing Co., Houston, pp 67-95, 1932.

60. Trask, Parker D. "Mechanical Analysis by Centrifuge," *Economic Geology*, Vol. 25, pp. 581-599.

61. Whittles, C. L. "Method for the Disintegration of Soil Aggregates and the Preparation of Soil Suspensions," *Journal Agricultural Science*, Vol. 14, pp. 346-369, 1924.

62. Wiegner, G. "Methods of Preparation of Soil Suspensions and Degree of Dispersion as Measured by Weigner-Gessner Apparatus," *Soil Science*, Vol. 23, pp. 377-390, 1927 (Translated by R. M. Barnette).

63. Willis, E. A., Robeson, F. A., and Johnson, C. M. "Graphical Solution of the Data Furnished by the Hydrometer Method of Analysis," *Public Roads*, Vol. 12, No. 8, October 1931.

64. Wintermyer, A. M., Willis, E. A., and Thoreen, R. C. "Procedures for Testing Soils for the Determination of the Subgrade Soil Constants," *Public Roads*, Vol. 12, No. 8, October 1931, pp. 197-207.

65. Winters, E. Jr., and Harland, M. B. "Preparation of Soil Samples for Pipette Analysis," *Journal* American Society of Agronomy, Vol. 22, pp. 771-780, 1930.

66. Wagner, L. A. "A Rapid Method for the Determination of the Specific Surface of Portland Cement," *Proceedings*, ASTM, Vol. 33, Part 2, pp. 553-570.

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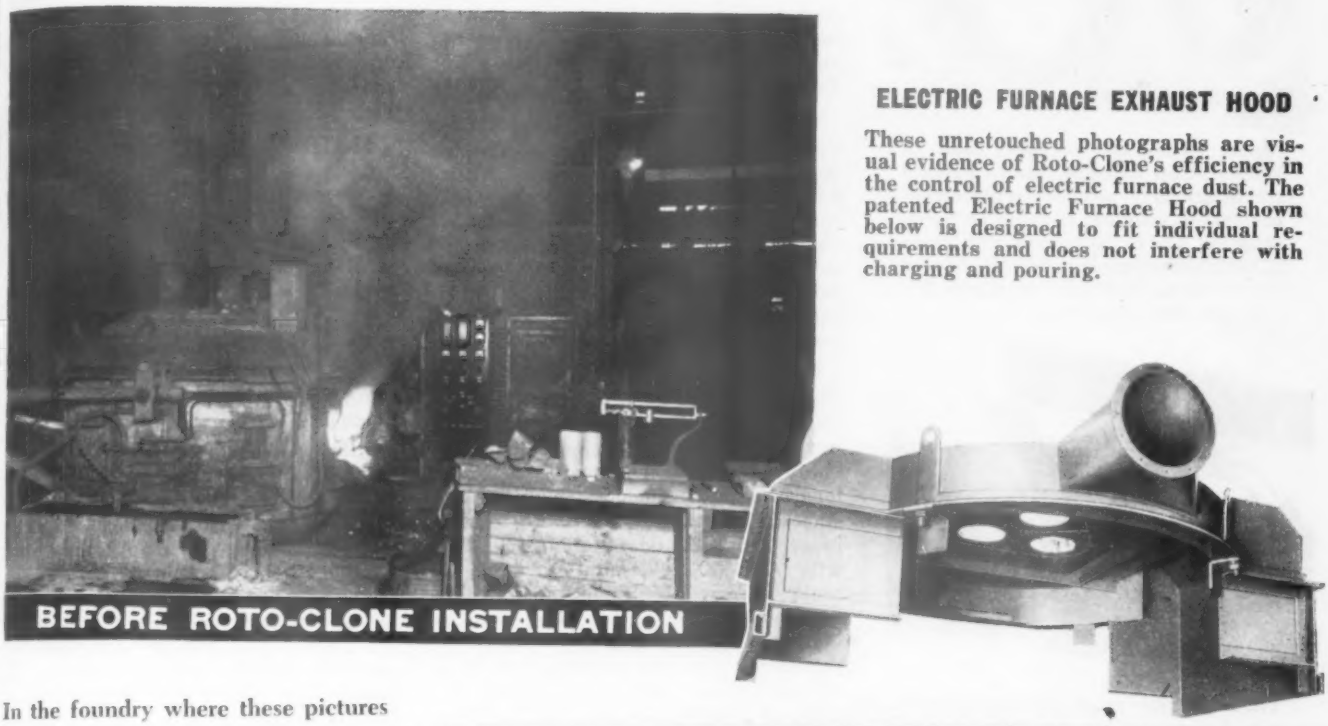

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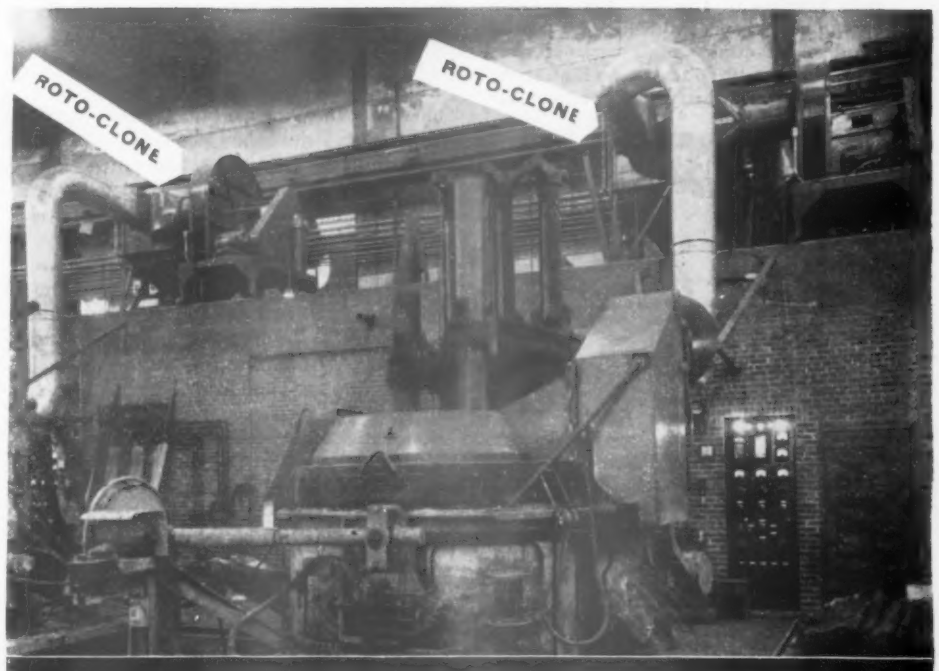

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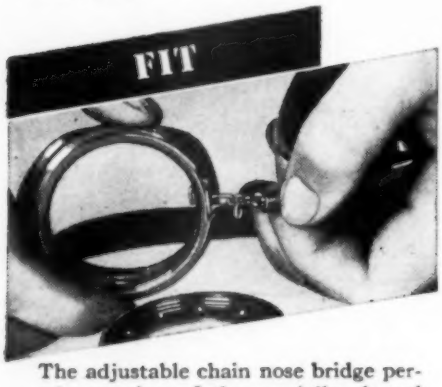

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RESISTORS — Techtmann Industries Inc., 828 North Broadway, Milwaukee 2, distributors for Regan Engineering Corp., Milwaukee, has published a 4-page folder giving specifications for resistors with shock-tested, salt-spray-tested, single unit and bank type, glazed steatite cores. Description of radiant heaters for temperatures to 1700 degrees Fahr. is included.

ENGINEERING DATA — Colonial Supply Co., 217 Water St., Pittsburgh 22, has published a catalog containing 800 pages of engineering and detail information on more than 20,000 items used for all classes of industrial, contracting and mining operations. It is available on request.

SAND MIXERS—Of interest to foundry engineers is an 18-page handbook released by National Engineering Co., Machinery Hall Building, Chicago 6, which gives a complete description of sand preparation and handling equipment. Diagrammatic drawings showing various types of mixer installations in sand preparing units are presented and dimensions and sizes of mixers are given.

INSULATING BRICK — Harbison-Walker Refractories Co., Pittsburgh 22, has published an informative 13-page brochure in color, containing comprehensive information on five brands of insulating brick. Application of the brick in industrial furnace linings is discussed and illustrations of various types of furnaces are shown. Specific data on the thermal and other physical properties of the brick are included.